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STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

NOTICE TO CONTRACTORS AND SPECIAL PROVISIONS

**FOR CONSTRUCTION ON STATE HIGHWAY IN
SOLANO AND CONTRA COSTA COUNTIES IN BENICIA AND MARTINEZ FROM 1.0 km NORTH OF
SOLANO AND CONTRA COSTA COUNTY LINE TO 1.1 km NORTH OF MOCOCO OVERHEAD**

DISTRICT 04, ROUTE 680

**For Use in Connection with Standard Specifications Dated JULY 1999, Standard Plans Dated JULY 1999, and Labor
Surcharge and Equipment Rental Rates.**

CONTRACT NO. 04-006034
04-CC,Sol-680-40.1/41.4 - L0.0/L1.0

Federal Aid Project
***ACIM-680-1(054)56N**

Bids Open: May 16, 2001
Dated: February 13, 2001

OSD

IMPORTANT SPECIAL NOTICES

PROJECT FUNDING AND OPENING OF PROPOSALS

Funding for this project is contingent upon availability of funding by the Bay Area Toll Authority (BATA). The Authority intends to issue revenue bonds for the purpose of financing the project. After the issuance of the bonds, the BATA Treasurer / Controller will determine if there are sufficient funds for the project. Upon such determination, BATA will recommend to the Authority that funds be allocated. This allocation is expected to be made in April 2001. Proposals will be opened and read publicly at the time and place set forth in the "Notice to Contractors", upon notice received from BATA that such funds have been allocated. If such notice from BATA has not been received within five (5) days prior to the bid opening date, a contract addendum to postpone the opening of proposals will be issued by the Department, and those bidders who have obtained project plans, special provisions and proposal forms from the Department's Plans and Bid Documents Room will be so notified.

- The bidder's attention is directed to Section 5, containing specifications for "Disputes Review Board," of the Special Provisions, regarding establishing a Disputes Review Board (DRB) for the project.
- The Special Provisions for Federal-aid projects (with and without DBE goals) have been revised to incorporate changes made by new regulations governing the DBE Program (49 CFR Part 26).

Sections 2 and 5 incorporate the changes. Bidders should read these sections to become familiar with them. Attention is directed to the following significant changes:

Section 2, "Disadvantaged Business Enterprise (DBE)" revises the counting of participation by DBE primes, and the counting of trucking performed by DBE firms. The section also revises the information that must be submitted to the Department in order to receive credit for trucking.

Section 2, "Submission of DBE Information" revises the information required to be submitted to the Department to receive credit toward the DBE goal. It also revises the criteria to demonstrate good faith efforts.

Section 5, "Subcontractor and DBE Records" revises the information required to be reported at the end of the project, and information related to trucking that must be submitted throughout the project.

Section 5, "DBE Certification Status" adds new reporting requirements related to DBE certification.

Section 5, "Subcontracting" describes the efforts that must be made in the event a DBE subcontractor is terminated or fails to complete its work for any reason.

Section 5, "Prompt Progress Payment to Subcontractors" requires prompt payment to all subcontractors.

Section 5, "Prompt Payment of Withheld Funds to Subcontractors" requires the prompt payment of retention to all subcontractors.

- **SURETY 2000**

Caltrans is conducting a pilot program in cooperation with Surety 2000, to test electronic bond verification systems. The purpose of the pilot program is to test the use of Surety 2000 for verifying a bidder's bond electronically.

Surety 2000 is an Internet-based surety verification and security system, developed in conjunction with the surety industry. Surety agents may contact Surety 2000 at 1-800-660-3263.

Bidders are encouraged to participate in the pilot program. To participate, the bidder is asked to provide the "Authorization Code" provided by Surety 2000, on a separate sheet, together with the standard bidder's bond required by the specifications. The bidder's surety agent may obtain the "Authorization Code" from Surety 2000.

The Department will use the "Authorization Code" to access the Surety 2000 database, and independently verify the actual bidder's bond and document the functioning of the Surety 2000 system.

"Authorization Codes" will be used only to verify bidder's bonds, and only as part of the pilot program. The use of "Authorization Codes" will not be accepted in lieu of the bidder's bond or other bidder's security required in the specifications during the pilot study.

The function of the Surety 2000 system is to provide an easier way for Contractors to protect their bid security, and to discourage fraud. This system is available to all California admitted sureties and surety agents.

The results of the pilot study will be tabulated, and at some time in the future, the Department may consider accepting electronic bidder's bond verification in lieu of the bidder's bond specified.

- **Payment Bonds**

Attention is directed to Section 5 of the Special Provisions, regarding contract bonds. The payment bond shall be in a sum not less than one hundred percent of the total amount payable by the terms of the contract.

- Attention is directed to Section 3, "Award and Execution of Contract," of these special provisions for special requirements for anticipated time of award and time allowed for return of documents by the successful bidder. If properly executed by the bidder, it is anticipated that the contract will be approved within 24 hours of when the executed contract and contract bonds are received by the Department.
- Attention is directed to Section 2, "Escrow Of Bid Documentation," of these special provisions regarding the submittal of bid documentation to be escrowed.

PRE-AWARD MEETING SPECIAL NOTICE

The bidder's attention is directed to Section 2-1.06, "Bridge Construction Information/Questionnaire," and Section 3, "Pre-Award Meeting and Award and Execution of Contract," in the Special Provisions.

Responses to the **"Bridge Construction Information/Questionnaire"** included in the Proposal must be **submitted with the bid.**

A pre-award **qualifications review meeting** will be conducted with the apparent low bidder on May 18, 2001 **at 10:00 a.m. in the third floor conference room, 1727 - 30th Street, Sacramento, CA 95816.** The purpose of the meeting will be to determine the bidder's qualifications and ability to complete the construction work on this project. The second and third apparent low bidders may also be requested to participate in pre-award qualifications review meetings.

Establishing to the satisfaction of the Department the bidder's qualifications and ability to complete the bridge construction work in a safe and timely manner is a condition for being eligible for award of the contract.

A + B BIDDING SPECIAL NOTICE

The bidder's attention is directed to Section 2, "Proposal Requirements and Conditions," Section 3-1.01B, "Award and Execution of Contract," and Section 4, "Beginning of Work, Time of Completion and Liquidated Damages," in the special provisions. In addition to the item prices and totals, the proposal shall set forth the number of working days bid to complete all the work (except the work defined as Phase II in Section 10-4.01, "Electrical Monitoring Systems"). Working days are defined in Section 4. All bids will be compared on the basis of the sum of the Engineer's Estimate of the quantities of work to be done (TOTAL BID (A)), plus the product of the number of working days bid to complete all work (except the work defined as Phase II in Section 10-4.01, "Electrical Monitoring Systems"), and the cost per day shown on the Engineer's Estimate (TOTAL BID (B)). The lowest bid will be determined on the basis of the "Total Basis for Comparison of Bids" set forth in the Engineer's Estimate.

Bids in which the number of working days bid for completion of the work (except the work defined as Phase II in section 10-4.01, "Electrical Monitoring Systems") exceed 1200 will be considered non-responsive and will be rejected.

The bidder's attention is also directed to the provisions of Section 10-1.03, "Overhead," of these Special Provisions.

The contract lump sum price paid for time related overhead will be based on the number of days bid to complete work (except the work defined as Phase II in section 10-4.01, "Electrical Monitoring Systems"). The lump sum prices paid for the various items of work defined as Phase II in Section 10-4.01, "Electrical Monitoring Systems" shall include all costs for all overhead, including time related overhead and no additional compensation will be allowed therefor.

The bidder's attention is also directed to the provisions in Section 4 of the special provisions regarding liquidated damages.

No incentive payments will be paid nor will disincentive deductions be charged on this project.

For purposes of determining liquidated damages, all work must be completed and the contract accepted by the Director, as specified in Section 7-1.17, "Acceptance of Contract," of the Standard Specifications.

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STANDARD PLANS LIST

The Standard Plan sheets applicable to this contract include, but are not limited to those indicated below. The Revised Standard Plans (RSP) and New Standard Plans (NSP) which apply to this contract are included as individual sheets of the project plans.

A10A	Abbreviations
A10B	Symbols
A20A	Pavement Markers and Traffic Lines, Typical Details
A20B	Pavement Markers and Traffic Lines, Typical Details
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A24B	Pavement Markings - Arrows
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A82D	Crash Cushion (Type REACT 9SCBS)
A85	Chain Link Fence
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D73	Drainage Inlets
D74A	Drainage Inlets
D74B	Drainage Inlets
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D75C	Pipe Inlets
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D94A	Metal and Plastic Flared End Sections
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D97A	Corrugated Metal Pipe Coupling Details No. 1 - Annular Coupling Band Bar and Strap and Angle Connectors
D97B	Corrugated Metal Pipe Coupling Details No. 2 - Hat Band Coupler and Flange Details
D97C	Corrugated Metal Pipe Coupling Details No. 3 - Helical and Universal Couplers
D97D	Corrugated Metal Pipe Coupling Details No. 4 - Hugger Coupling Bands
D97E	Corrugated Metal Pipe Coupling Details No. 5 - Standard Joint
D97G	Corrugated Metal Pipe Coupling Details No. 7 - Positive Joints and Downdrains
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D99A	Structural Section Drainage System Details
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D99C	Edge Drain Cleanout and Vent Details

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D102	Underdrains
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T11	Traffic Control System for Lane Closure On Multilane Conventional Highways
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B0-3	Bridge Details
B0-5	Bridge Details
B0-13	Bridge Details
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DEPARTMENT OF TRANSPORTATION

NOTICE TO CONTRACTORS

CONTRACT NO. 04-006034

04-CC,Sol-680-40.1/41.4 - L0.0/L1.0

Sealed proposals for the work shown on the plans entitled:

**STATE OF CALIFORNIA; DEPARTMENT OF TRANSPORTATION; PROJECT PLANS FOR CONSTRUCTION
ON STATE HIGHWAY IN SOLANO AND CONTRA COSTA COUNTIES IN BENICIA AND MARTINEZ
FROM 1.0 km NORTH OF SOLANO AND CONTRA COSTA COUNTY LINE TO 1.1 km NORTH
OF MOCOCO OVERHEAD**

will be received at the Department of Transportation, 1120 N Street, Room 0200, MS #26, Sacramento, CA 95814, until 2 o'clock p.m. on May 16, 2001, at which time they will be publicly opened and read in Room 0100 at the same address.

Proposal forms for this work are included in a separate book entitled:

**STATE OF CALIFORNIA; DEPARTMENT OF TRANSPORTATION; PROPOSAL AND CONTRACT FOR
CONSTRUCTION ON STATE HIGHWAY IN SOLANO AND CONTRA COSTA COUNTIES IN BENICIA AND
MARTINEZ FROM 1.0 km NORTH OF SOLANO AND CONTRA COSTA COUNTY LINE TO 1.1 km NORTH OF
MOCOCO OVERHEAD**

General work description: Construct New Benicia Martinez Bridge, a four frame 2265.90 meter long cast-in-place post tensioned concrete bridge spanning over the Carquinez Straits.

This project has a goal of 9 percent disadvantaged business enterprise (DBE) participation.

A prebid meeting is scheduled for 10:00 am, May 18, 2001, at third floor conference room, 1727 - 30th Street, Sacramento, CA 95816. This meeting is to inform DBEs of subcontracting and material supply opportunities. Bidder's attendance at this meeting will be considered in determining the bidder's good faith effort to obtain DBE participation.

**THIS PROJECT IS SUBJECT TO THE "BUY AMERICA" PROVISIONS OF THE SURFACE
TRANSPORTATION ASSISTANCE ACT OF 1982 AS AMENDED BY THE INTERMODAL SURFACE
TRANSPORTATION EFFICIENCY ACT OF 1991.**

Bidders inquiries may be made as follows:

For all inquiries: Toll Bridge Retrofit Program Duty Senior at District 04 Office, 111 Grand Avenue, Oakland, California 94612; Fax Number (510) 286-5549; E-mail address, duty_senior_tollbridge_district04@dot.ca.gov; Telephone Number (510) 286-5549. Internet inquiries at:

"<http://www.dot.ca.gov/hq/esc/tollbridge/Ben-Mar/006034/inquiry.html>".

Bidders will be requested to submit their inquiries in writing to the Oakland address, accompanied by an electronic copy where feasible, in order to avoid any misunderstandings. Written inquiries shall include the bidder's name, address and phone number. Written inquiries will be investigated and an addendum to the contract will be issued to the extent feasible and at the discretion of the Department. A copy of each addendum will also be posted on the Internet at "http://www.dot.ca.gov/hq/esc/oe/project_ads_addenda/04/04-006034".

Bids are required for the entire work described herein.

At the time this contract is awarded, the Contractor shall possess either a Class A license or any combination of the following Class C licenses which constitutes a majority of the work: C-8, C-61D30.

This contract is subject to state contract nondiscrimination and compliance requirements pursuant to Government Code, Section 12990.

Project plans, special provisions, and proposal forms for bidding this project can only be obtained at the Department of Transportation, Plans and Bid Documents, Room 0200, MS #26, Transportation Building, 1120 N Street, Sacramento, California 95814, FAX No. (916) 654-7028, Telephone No. (916) 654-4490. Use FAX orders to expedite orders for project plans, special provisions and proposal forms. FAX orders must include credit card charge number, card expiration date and authorizing signature. Project plans, special provisions, and proposal forms may be seen at the above Department of Transportation office and at the offices of the District Directors of Transportation at Irvine, Oakland, and the district in which the work is situated. Standard Specifications and Standard Plans are available through the State of California, Department of Transportation, Publications Unit, 1900 Royal Oaks Drive, Sacramento, CA 95815, Telephone No. (916) 445-3520.

Cross sections for this project are not available.

The successful bidder shall furnish a payment bond and a performance bond.

The Department of Transportation hereby notifies all bidders that it will affirmatively insure that in any contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full opportunity to submit bids in response to this invitation.

The U.S. Department of Transportation (DOT) provides a toll-free "hotline" service to report bid rigging activities. Bid rigging activities can be reported Mondays through Fridays, between 8:00 a.m. and 5:00 p.m., eastern time, Telephone No. 1-800-424-9071. Anyone with knowledge of possible bid rigging, bidder collusion, or other fraudulent activities should use the "hotline" to report these activities. The "hotline" is part of the DOT's continuing effort to identify and investigate highway construction contract fraud and abuse and is operated under the direction of the DOT Inspector General. All information will be treated confidentially and caller anonymity will be respected.

Pursuant to Section 1773 of the Labor Code, the general prevailing wage rates in the county, or counties, in which the work is to be done have been determined by the Director of the California Department of Industrial Relations. These wages are set forth in the General Prevailing Wage Rates for this project, available at the Labor Compliance Office at the offices of the District Director of Transportation for the district in which the work is situated, and available from the California Department of Industrial Relations' Internet Web Site at: <http://www.dir.ca.gov>. The Federal minimum wage rates for this project as predetermined by the United States Secretary of Labor are set forth in the books issued for bidding purposes entitled "Proposal and Contract," and in copies of this book that may be examined at the offices described above where project plans, special provisions, and proposal forms may be seen. Addenda to modify the Federal minimum wage rates, if necessary, will be issued to holders of "Proposal and Contract" books. Future effective general prevailing wage rates which have been predetermined and are on file with the California Department of Industrial Relations are referenced but not printed in the general prevailing wage rates.

Attention is directed to the Federal minimum wage rate requirements in the books entitled "Proposal and Contract." If there is a difference between the minimum wage rates predetermined by the Secretary of Labor and the general prevailing wage rates determined by the Director of the California Department of Industrial Relations for similar classifications of labor, the Contractor and subcontractors shall pay not less than the higher wage rate. The Department will not accept lower State wage rates not specifically included in the Federal minimum wage determinations. This includes "helper" (or other classifications based on hours of experience) or any other classification not appearing in the Federal wage determinations. Where Federal wage determinations do not contain the State wage rate determination otherwise available for use by the Contractor and subcontractors, the Contractor and subcontractors shall pay not less than the Federal minimum wage rate which most closely approximates the duties of the employees in question.

DEPARTMENT OF TRANSPORTATION

Deputy Director Transportation Engineering

Dated February 13, 2001

EMA

COPY OF ENGINEER'S ESTIMATE
(NOT TO BE USED FOR BIDDING PURPOSES)

04-006034

Item	Item Code	Item	Unit of Measure	Estimated Quantity
1	020627	ELECTRONIC MOBILE DAILY DIARY COMPUTER SYSTEM DATA DELIVERY	LS	LUMP SUM
2	020628	MODIFY MONITORING WELLS	EA	1
3	020629	ABANDON MONITORING WELLS	EA	2
4	020630	REMOVE ABANDONED 51 MM GAS LINE	M	210
5	020631	REMOVE 254 MM WATER LINE (ASBESTOS)	M	230
6 (S)	020632	ROADWAY EXCAVATION (HAZARDOUS)	M3	1290
7 (S)	020633	ROADWAY EXCAVATION (CONTAMINATED)	M3	4220
8	020634	TIME RELATED OVERHEAD	WDAY	1100
9	070010	PROGRESS SCHEDULE (CRITICAL PATH)	LS	LUMP SUM
10	020635	TRANSPORTATION FOR ENGINEER	LS	LUMP SUM
11	071322	TEMPORARY FENCE (TYPE CL-1.8)	M	525
12	048467	TEMPORARY HINGE TIEDOWN	EA	6
13	074019	PREPARE STORM WATER POLLUTION PREVENTION PLAN	LS	LUMP SUM
14	074020	WATER POLLUTION CONTROL	LS	LUMP SUM
15	020636	NON-STORM WATER DISCHARGES	LS	LUMP SUM
16	020637	TEMPORARY SILT FENCE	M	480
17	020638	TEMPORARY COVER	LS	LUMP SUM
18	020639	TEMPORARY DRAINAGE INLET PROTECTION	EA	15
19	020640	TEMPORARY CONCRETE WASHOUT FACILITY	LS	LUMP SUM
20	020641	TEMPORARY FENCE (TYPE ESA)	M	130

Item	Item Code	Item	Unit of Measure	Estimated Quantity
21	020642	TEMPORARY ENTRANCE/EXIT	LS	LUMP SUM
22	020643	FIBER ROLL CHECK DAM	EA	8
23	120090	CONSTRUCTION AREA SIGNS	LS	LUMP SUM
24	129000	TEMPORARY RAILING (TYPE K)	M	25
25	129510	TEMPORARY RETAINING WALL	M2	780
26	150608	REMOVE CHAIN LINK FENCE	M	290
27	020644	REMOVE CHAIN LINK FENCE (TYPE CL-1.8 WITH EXTENSION ARM AND 3-BARBED WIRES)	M	250
28	150710	REMOVE TRAFFIC STRIPE	M	1120
29	150713	REMOVE PAVEMENT MARKING	M2	60
30	150744	REMOVE ROADSIDE SIGN (WOOD POST)	EA	1
31	150745	REMOVE ROADSIDE SIGN (METAL POST)	EA	1
32	152396	RELOCATE SIGN PANEL	EA	1
33	152604	MODIFY INLET	EA	1
34	160101	CLEARING AND GRUBBING	LS	LUMP SUM
35	190101	ROADWAY EXCAVATION	M3	13 200
36	192001	STRUCTURE EXCAVATION	M3	310
37 (F)	048429	STRUCTURE EXCAVATION (BRIDGE)(HAZARDOUS)	M3	170
38 (F)	048430	STRUCTURE EXCAVATION (BRIDGE)(CONTAMINATED)	M3	95
39 (F)	192008	STRUCTURE EXCAVATION (TYPE A)	M3	8830
40 (F)	048431	STRUCTURE EXCAVATION (TYPE A) (CONTAMINATED)	M3	2500

Item	Item Code	Item	Unit of Measure	Estimated Quantity
41 (F)	192020	STRUCTURE EXCAVATION (TYPE D)	M3	1030
42 (F)	048432	STRUCTURE EXCAVATION (TYPE D)(CONTAMINATED)	M3	86
43 (F)	193003	STRUCTURE BACKFILL (BRIDGE)	M3	1300
44 (F)	048433	STRUCTURE BACKFILL (BRIDGE) (LOW PERMEABLE) (0.7 MPA)	M3	2200
45 (F)	048434	STRUCTURE BACKFILL (BRIDGE) (LOW PERMEABLE) (6.9 MPA)	M3	371
46 (F)	193114	SAND BACKFILL	M3	2770
47	194001	DITCH EXCAVATION	M3	90
48	020645	IMPORTED BORROW (50-MM LIGHTWEIGHT AGGREGATE)	M3	370
49	020646	IMPORTED BORROW (25-MM LIGHTWEIGHT AGGREGATE)	M3	45
50	203001	EROSION CONTROL (BLANKET)	M2	440
51	020647	FIBER ROLLS	M	970
52	203003	STRAW (EROSION CONTROL)	TONN	5.6
53	203014	FIBER (EROSION CONTROL)	KG	880
54	203024	COMPOST (EROSION CONTROL)	KG	2650
55	203045	PURE LIVE SEED (EROSION CONTROL)	KG	90
56	203056	COMMERCIAL FERTILIZER (EROSION CONTROL)	KG	290
57	203061	STABILIZING EMULSION (EROSION CONTROL)	KG	200
58	250401	CLASS 4 AGGREGATE SUBBASE	M3	140
59	260301	CLASS 3 AGGREGATE BASE	M3	630
60	290201	ASPHALT TREATED PERMEABLE BASE	M3	30

Item	Item Code	Item	Unit of Measure	Estimated Quantity
61	390155	ASPHALT CONCRETE (TYPE A)	TONN	1380
62	390165	ASPHALT CONCRETE (OPEN GRADED)	TONN	25
63	394001	PLACE ASPHALT CONCRETE DIKE	M	30
64	394002	PLACE ASPHALT CONCRETE (MISCELLANEOUS AREA)	M2	60
65 (S)	490658	750 MM CAST-IN-DRILLED-HOLE CONCRETE PILING	M	381
66 (S)	048435	2.2 M CAST-IN-DRILLED-HOLE CONCRETE PILING (ROCK SOCKET)	M	2220
67 (S)	490672	2.5 M CAST-IN-DRILLED-HOLE CONCRETE PILING	M	4460
68 (S)	048436	2.5 M PERMANENT STEEL CASING	M	4460
69 (S)	048437	2.6 M CAST-IN-DRILLED-HOLE CONCRETE PILING	M	291
70 (S)	048438	INSTALL SEISMIC MONITORING CASING	LS	LUMP SUM
71 (S)	048439	PRESTRESSING HIGH STRENGTH ROD	LS	LUMP SUM
72 (S)	048440	PRESTRESSING CAST-IN-PLACE CONCRETE (SUPERSTRUCTURE)	LS	LUMP SUM
73 (S)	048441	PRESTRESSING CAST-IN-PLACE CONCRETE (SUBSTRUCTURE)	LS	LUMP SUM
74 (F)	510000	SEAL COURSE CONCRETE	M3	1606
75	048442	TEST BLOCKS	LS	LUMP SUM
76 (F)	510051	STRUCTURAL CONCRETE, BRIDGE FOOTING	M3	19 700
77 (F)	510053	STRUCTURAL CONCRETE, BRIDGE	M3	27 060
78 (S-F)	048443	PRECAST PIER FOOTING FORM	M3	7740
79 (F)	048444	STRUCTURAL CONCRETE, LIGHTWEIGHT	M3	41 600
80 (F)	510086	STRUCTURAL CONCRETE, APPROACH SLAB (TYPE N)	M3	68

Item	Item Code	Item	Unit of Measure	Estimated Quantity
81 (F)	048445	STRUCTURAL CONCRETE, FENDER	M3	730
82	510502	MINOR CONCRETE (MINOR STRUCTURE)	M3	20
83	510504	MINOR CONCRETE (PIPE ENCASEMENT)	M3	10
84 (F)	511064	FRACTURED RIB TEXTURE	M2	1660
85 (S)	515050	GRIND BRIDGE DECK	LS	LUMP SUM
86 (S)	048446	PTFE SPHERICAL BEARING (380 MM DIA)	EA	2
87 (S)	048447	PTFE SPHERICAL BEARING (480 MM DIA)	EA	2
88 (S)	048448	PTFE SPHERICAL BEARING (600 MM DIA)	EA	2
89 (S)	048449	PTFE SPHERICAL BEARING (815 MM DIA)	EA	2
90 (S)	048450	HINGE C AND D BEARING (TYPE I)	EA	16
91 (S)	048451	HINGE C AND D BEARING (TYPE II)	EA	4
92 (S)	048452	ELASTOMERIC BUMPERS	LS	LUMP SUM
93 (S)	048453	JOINT SEAL (MR 20 MM)	M	25
94 (S)	519132	JOINT SEAL ASSEMBLY (MR 321 MM - 400 MM)	M	25
95 (S)	048454	JOINT SEAL ASSEMBLY (MR 900 MM)	M	25
96 (S)	048455	JOINT SEAL ASSEMBLY (MR 1000 MM)	M	79
97 (S-F)	520102	BAR REINFORCING STEEL (BRIDGE)	KG	21 930 000
98 (S-F)	520110	BAR REINFORCING STEEL (EPOXY COATED) (BRIDGE)	KG	4 600 000
99	048456	WELDED HEADED BAR REINFORCEMENT	EA	89 500
100 (S-F)	048457	WELDED HEADED BAR REINFORCEMENT (EPOXY COATED)	EA	43 500

Item	Item Code	Item	Unit of Measure	Estimated Quantity
101 (S-F)	550203	FURNISH STRUCTURAL STEEL (BRIDGE)	KG	289 400
102 (S-F)	550204	ERECT STRUCTURAL STEEL (BRIDGE)	KG	289 400
103 (F)	560218	FURNISH SIGN STRUCTURE (TRUSS)	KG	20 680
104 (S-F)	560219	INSTALL SIGN STRUCTURE (TRUSS)	KG	20 680
105	562004	METAL (RAIL MOUNTED SIGN)	KG	700
106	566011	ROADSIDE SIGN - ONE POST	EA	1
107 (S-F)	048458	REINFORCED RECYCLED PLASTIC LUMBER	M3	790
108 (S)	590115	CLEAN AND PAINT STRUCTURAL STEEL	LS	LUMP SUM
109	620907	300 MM ALTERNATIVE PIPE CULVERT (TYPE C)	M	30
110	620909	450 MM ALTERNATIVE PIPE CULVERT	M	45
111	650079	900 MM REINFORCED CONCRETE PIPE	M	80
112 (S-F)	048459	3660 MM CORRUGATED STEEL PIPE	M	85
113	681135	100 MM PLASTIC PIPE (EDGE DRAIN)	M	15
114	705334	300 MM ALTERNATIVE FLARED END SECTION	EA	3
115	705336	450 MM ALTERNATIVE FLARED END SECTION	EA	2
116	721009	ROCK SLOPE PROTECTION (FACING, METHOD B)	M3	40
117	020648	SUB-GRADE ENHANCEMENT FABRIC	M2	380
118	729010	ROCK SLOPE PROTECTION FABRIC	M2	85
119	731501	MINOR CONCRETE (CURB)	M3	2
120	731502	MINOR CONCRETE (MISCELLANEOUS CONSTRUCTION)	M3	120

Item	Item Code	Item	Unit of Measure	Estimated Quantity
121 (F)	750001	MISCELLANEOUS IRON AND STEEL	KG	108
122 (S-F)	750501	MISCELLANEOUS METAL (BRIDGE)	KG	29 430
123 (S-F)	750505	BRIDGE DECK DRAINAGE SYSTEM	KG	13 600
124 (S)	048460	MISCELLANEOUS METAL (MAINTENANCE ACCESS)	LS	LUMP SUM
125 (S)	048461	MISCELLANEOUS METAL (MOVABLE INSPECTION PLATFORMS)	LS	LUMP SUM
126	800386	CHAIN LINK FENCE (TYPE CL-1.2, VINYL-CLAD)	M	35
127	800391	CHAIN LINK FENCE (TYPE CL-1.8)	M	900
128	020649	CHAIN LINK FENCE (TYPE CL-1.8, WITH EXTENSION ARM AND 3-BARBED WIRES)	M	250
129 (F)	048462	FIBERGLASS GRATING	M2	260
130 (F)	048463	FIBERGLASS REINFORCED PLASTIC DOOR FRAME	EA	11
131	802584	0.9 M CHAIN LINK GATE (TYPE CL-1.8)	EA	1
132	802594	2.7 M CHAIN LINK GATE (TYPE CL-1.8)	EA	1
133	802596	3.7 M CHAIN LINK GATE (TYPE CL-1.8)	EA	1
134	802672	4.9 M CHAIN LINK GATE (TYPE CL-1.8)	EA	2
135	802676	7.3 M CHAIN LINK GATE (TYPE CL-1.8)	EA	1
136 (S)	048464	CONSTRUCTION SURVEYING	LS	LUMP SUM
137 (F)	810110	SURVEY MONUMENT	EA	24
138 (S-F)	833033	CHAIN LINK RAILING (TYPE 7 MODIFIED)	M	190
139 (S-F)	833090	TUBULAR HANDRAILING (MODIFIED)	M	168
140 (F)	833128	CONCRETE BARRIER (TYPE 25 MODIFIED)	M	4564

Item	Item Code	Item	Unit of Measure	Estimated Quantity
141	020650	CRASH CUSHION (REACT 350.9)	EA	1
142 (S)	840515	THERMOPLASTIC PAVEMENT MARKING	M2	150
143 (S)	840561	100 MM THERMOPLASTIC TRAFFIC STRIPE	M	5750
144 (S)	840562	150 MM THERMOPLASTIC TRAFFIC STRIPE	M	110
145 (S)	840563	200 MM THERMOPLASTIC TRAFFIC STRIPE	M	420
146 (S)	840564	200 MM THERMOPLASTIC TRAFFIC STRIPE (BROKEN 3.66 M - 0.92 M)	M	850
147 (S)	840568	100 MM THERMOPLASTIC TRAFFIC STRIPE (BROKEN 3.66 M - 0.92 M)	M	170
148 (S)	850101	PAVEMENT MARKER (NON-REFLECTIVE)	EA	2250
149 (S)	850111	PAVEMENT MARKER (RETROREFLECTIVE)	EA	910
150 (S)	860297	SIGNAL AND LIGHTING (CITY)	LS	LUMP SUM
151 (S)	020651	TRAFFIC OPERATIONS SYSTEM	LS	LUMP SUM
152 (S)	020652	ELECTRICAL FACILITIES 1	LS	LUMP SUM
153 (S)	020653	ELECTRICAL FACILITIES 2	LS	LUMP SUM
154 (S)	020654	ELECTRICAL FACILITIES 3	LS	LUMP SUM
155 (S)	020655	ELECTRICAL FACILITIES 4	LS	LUMP SUM
156 (S)	020656	ELECTRICAL FACILITIES 5	LS	LUMP SUM
157 (S)	020657	ELECTRICAL FACILITIES 6	LS	LUMP SUM
158 (S)	020658	ELECTRICAL FACILITIES 7	LS	LUMP SUM
159 (S)	020659	ELECTRICAL FACILITIES 8	LS	LUMP SUM
160 (S)	020660	ELECTRICAL FACILITIES 9	LS	LUMP SUM

Item	Item Code	Item	Unit of Measure	Estimated Quantity
161 (S)	020661	PIER 3 SUBSTATION CONDUIT LAYOUT	LS	LUMP SUM
162 (S)	020662	CONDUIT LAYOUT IN PIERS 6 THROUGH 8	LS	LUMP SUM
163 (S)	020663	CONDUIT LAYOUT IN PIERS 9 THROUGH 15	LS	LUMP SUM
164 (S)	020664	PIER 3 SUBSTATION GROUNDING LAYOUT	LS	LUMP SUM
165 (S)	020665	MARINE NAVIGATIONAL AIDS SYSTEM	LS	LUMP SUM
166	869072	SEISMIC MONITORING SYSTEM	LS	LUMP SUM
167	048465	HEALTH MONITORING SYSTEM	LS	LUMP SUM
168	048466	HEALTH MONITORING SYSTEM (SHIPPING CHANNEL SPAN)	LS	LUMP SUM
169	020666	RELOCATE PARK FACILITIES	LS	LUMP SUM
170	994629	RELOCATE TRAILER	LS	LUMP SUM
171	994650	BUILDING WORK	LS	LUMP SUM
172	999990	MOBILIZATION	LS	LUMP SUM

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISIONS

Annexed to Contract No. 04-006034

SECTION 1. SPECIFICATIONS AND PLANS

The work embraced herein shall conform to the provisions in the Standard Specifications dated July 1999, and the Standard Plans dated July 1999, of the Department of Transportation insofar as the same may apply, and these special provisions.

Amendments to the Standard Specifications set forth in these special provisions shall be considered as part of the Standard Specifications for the purposes set forth in Section 5-1.04, "Coordination and Interpretation of Plans, Standard Specifications and Special Provisions," of the Standard Specifications. Whenever either the term "Standard Specifications is amended" or the term "Standard Specifications are amended" is used in the special provisions, the indented text or table following the term shall be considered an amendment to the Standard Specifications. In case of conflict between such amendments and the Standard Specifications, the amendments shall take precedence over and be used in lieu of the conflicting portions.

In case of conflict between the Standard Specifications and these special provisions, the special provisions shall take precedence over and shall be used in lieu of the conflicting portions.

SECTION 2. PROPOSAL REQUIREMENTS AND CONDITIONS

2-1.01 GENERAL

The bidder's attention is directed to the provisions in Section 2, "Proposal Requirements and Conditions," of the Standard Specifications and these special provisions for the requirements and conditions which the bidder must observe in the preparation of the Proposal form and the submission of the bid.

The proposal shall set forth the unit prices, item totals, TOTAL BID (A), the number of working days bid for completion of all the work (except the work defined as Phase II in Section 10-4.01, "Electrical Monitoring Systems"), the product of the working days bid to complete all the work (except the work defined as Phase II in Section 10-4.01, "Electrical Monitoring Systems") times the cost per day shown on the Engineer's Estimate (TOTAL BID (B)), and the "Total Basis for Comparison of Bids (A+B)," all in clearly legible figures, in the respective spaces provided, and shall be signed by the bidder, who shall fill out all blanks in the proposal form as therein required.

In addition to the subcontractors required to be listed in conformance with Section 2-1.054, "Required Listing of Proposed Subcontractors," of the Standard Specifications, each proposal shall have listed therein the portion of work that will be performed by each subcontractor listed.

The Bidder's Bond form mentioned in the last paragraph in Section 2-1.07, "Proposal Guaranty," of the Standard Specifications will be found following the signature page of the Proposal.

Submit request for substitution of an "or equal" item, and the data substantiating the request to the Department of Transportation, Division Of Construction - Duty Senior, Mail Station: 3 - B, 111 Grand Avenue / P. O. Box 23660, Oakland, CA 94623-0660, so that the request is received by the Department by close of business on the fourth day, not including Saturdays, Sundays and legal holidays, following bid opening.

In conformance with Public Contract Code Section 7106, a Noncollusion Affidavit is included in the Proposal. Signing the Proposal shall also constitute signature of the Noncollusion Affidavit.

The contractor, sub recipient or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the recipient deems appropriate. Each subcontract signed by the bidder must include this assurance.

The bidder's attention is directed to the provisions in Section 2, "Proposal Requirements and Conditions," of the Standard Specifications and these special provisions for the requirements and conditions which the bidder must observe in the preparation of the proposal form and the submission of the bid.

2-1.015 FEDERAL LOBBYING RESTRICTIONS

Section 1352, Title 31, United States Code prohibits Federal funds from being expended by the recipient or any lower tier subrecipient of a Federal-aid contract to pay for any person for influencing or attempting to influence a Federal agency or Congress in connection with the awarding of any Federal-aid contract, the making of any Federal grant or loan, or the entering into of any cooperative agreement.

If any funds other than Federal funds have been paid for the same purposes in connection with this Federal-aid contract, the recipient shall submit an executed certification and, if required, submit a completed disclosure form as part of the bid documents.

A certification for Federal-aid contracts regarding payment of funds to lobby Congress or a Federal agency is included in the Proposal. Standard Form - LLL, "Disclosure of Lobbying Activities," with instructions for completion of the Standard Form is also included in the Proposal. Signing the Proposal shall constitute signature of the Certification.

The above-referenced certification and disclosure of lobbying activities shall be included in each subcontract and any lower-tier contracts exceeding \$100,000. All disclosure forms, but not certifications, shall be forwarded from tier to tier until received by the Engineer.

The Contractor, subcontractors and any lower-tier contractors shall file a disclosure form at the end of each calendar quarter in which there occurs any event that requires disclosure or that materially affects the accuracy of the information contained in any disclosure form previously filed by the Contractor, subcontractors and any lower-tier contractors. An event that materially affects the accuracy of the information reported includes:

- A. A cumulative increase of \$25,000 or more in the amount paid or expected to be paid for influencing or attempting to influence a covered Federal action; or
- B. A change in the person(s) or individual(s) influencing or attempting to influence a covered Federal action; or,
- C. A change in the officer(s), employee(s), or Member(s) contacted to influence or attempt to influence a covered Federal action.

2-1.02 DISADVANTAGED BUSINESS ENTERPRISE (DBE)

This project is subject to Part 26, Title 49, Code of Federal Regulations entitled "Participation by Disadvantaged Business Enterprises in Department of Transportation Financial Assistance Programs." The Regulations in their entirety are incorporated herein by this reference.

Bidders shall be fully informed respecting the requirements of the Regulations and the Department's Disadvantaged Business Enterprise (DBE) program developed pursuant to the Regulations; particular attention is directed to the following matters:

- A. A DBE must be a small business concern as defined pursuant to Section 3 of U.S. Small Business Act and relevant regulations promulgated pursuant thereto.
- B. A DBE may participate as a prime contractor, subcontractor, joint venture partner with a prime or subcontractor, vendor of material or supplies, or as a trucking company.
- C. A DBE bidder, not bidding as a joint venture with a non-DBE, will be required to document one or a combination of the following:
 - 1. The bidder will meet the goal by performing work with its own forces.
 - 2. The bidder will meet the goal through work performed by DBE subcontractors, suppliers or trucking companies.
 - 3. The bidder, prior to bidding, made adequate good faith efforts to meet the goal.
- D. A DBE joint venture partner must be responsible for specific contract items of work, or portions thereof. Responsibility means actually performing, managing and supervising the work with its own forces. The DBE joint venture partner must share in the capital contribution, control, management, risks and profits of the joint venture. The DBE joint venturer must submit the joint venture agreement with the proposal or the DBE Information form required in the Section entitled "Submission of DBE Information" of these special provisions.
- E. A DBE must perform a commercially useful function, i.e., must be responsible for the execution of a distinct element of the work and must carry out its responsibility by actually performing, managing and supervising the work.
- F. DBEs must be certified by either the California Department of Transportation, or by a participating State of California or local agency which certifies in conformance with Title 49, Code of Federal Regulations, Part 26, as of the date of bid opening. It is the Contractor's responsibility to verify that DBEs are certified. Listings of DBEs certified by the Department are available from the following sources:

1. The Department's DBE Directory, which is published quarterly. This Directory may be obtained from the Department of Transportation, Materiel Operations Branch, Publication Distribution Unit, 1900 Royal Oaks Drive, Sacramento, California 95815, Telephone: (916) 445-3520.
2. The Department's Electronic Information Bulletin Board Service, which is accessible by modem and is updated weekly. The Bulletin Board may be accessed by first contacting the Department's Business Enterprise Program at Telephone: (916) 227-8937 and obtaining a user identification and password.
3. The Department's web site at <http://www.dot.ca.gov/hq/bep/index.htm>.
4. The organizations listed in the Section entitled "DBE Goal for this Project" of these special provisions.

G. Credit for materials or supplies purchased from DBEs will be as follows:

1. If the materials or supplies are obtained from a DBE manufacturer, 100 percent of the cost of the materials or supplies will count toward the DBE goal. A DBE manufacturer is a firm that operates or maintains a factory or establishment that produces, on the premises, the materials, supplies, articles, or equipment required under the contract and of the general character described by the specifications.
2. If the materials or supplies are purchased from a DBE regular dealer, 60 percent of the cost of the materials or supplies will count toward the DBE goal. A DBE regular dealer is a firm that owns, operates, or maintains a store, warehouse, or other establishment in which the materials, supplies, articles or equipment of the general character described by the specifications and required under the contract are bought, kept in stock, and regularly sold or leased to the public in the usual course of business. To be a DBE regular dealer, the firm must be an established, regular business that engages, as its principal business and under its own name, in the purchase and sale or lease of the products in question. A person may be a DBE regular dealer in such bulk items as petroleum products, steel, cement, gravel, stone, or asphalt without owning, operating, or maintaining a place of business as provided in this paragraph G.2. if the person both owns and operates distribution equipment for the products. Any supplementing of regular dealers' own distribution equipment shall be by a long-term lease agreement and not on an ad hoc or contract-by-contract basis. Packagers, brokers, manufacturers' representatives, or other persons who arrange or expedite transactions are not DBE regular dealers within the meaning of this paragraph G.2.
3. Credit for materials or supplies purchased from a DBE which is neither a manufacturer nor a regular dealer will be limited to the entire amount of fees or commissions charged for assistance in the procurement of the materials and supplies, or fees or transportation charges for the delivery of materials or supplies required on a job site, provided the fees are reasonable and not excessive as compared with fees charged for similar services.

H. Credit for DBE trucking companies will be as follows:

1. The DBE must be responsible for the management and supervision of the entire trucking operation for which it is responsible on a particular contract, and there cannot be a contrived arrangement for the purpose of meeting the DBE goal.
2. The DBE must itself own and operate at least one fully licensed, insured, and operational truck used on the contract.
3. The DBE receives credit for the total value of the transportation services it provides on the contract using trucks it owns, insures, and operates using drivers it employs.
4. The DBE may lease trucks from another DBE firm, including an owner-operator who is certified as a DBE. The DBE who leases trucks from another DBE receives credit for the total value of the transportation services the lessee DBE provides on the contract.
5. The DBE may also lease trucks from a non-DBE firm, including an owner-operator. The DBE who leases trucks from a non-DBE is entitled to credit only for the fee or commission it receives as a result of the lease arrangement. The DBE does not receive credit for the total value of the transportation services provided by the lessee, since these services are not provided by a DBE.
6. For the purposes of this paragraph H, a lease must indicate that the DBE has exclusive use of and control over the truck. This does not preclude the leased truck from working for others during the term of the lease with the consent of the DBE, so long as the lease gives the DBE absolute priority for use of the leased truck. Leased trucks must display the name and identification number of the DBE.

- I. Noncompliance by the Contractor with the requirements of the regulations constitutes a breach of this contract and may result in termination of the contract or other appropriate remedy for a breach of this contract.
- J. Bidders are encouraged to use services offered by financial institutions owned and controlled by DBEs.

2-1.02A DBE GOAL FOR THIS PROJECT

The Department has established the following goal for Disadvantaged Business Enterprise (DBE) participation for this project:

Disadvantaged Business Enterprise (DBE): 9 percent

Bidders may use the services of the following firms to contact interested DBEs. These firms are available to assist DBEs in preparing bids for subcontracting or supplying materials.

The following firms may be contacted for projects in the following locations:

Districts 04, 05 (except San Luis Obispo and Santa Barbara Counties), 06 (except Kern County) and 10:	Districts 08, 11 and 12:
Triaxial Management Services, Inc. - Oakland 1545 Willow Street, 1st Floor Oakland, CA 94607 Telephone - (510) 286-1313 FAX No. - (510) 286-6792	Triaxial Management Services, Inc. - San Diego 2725 Congress Street, Suite 1-D San Diego, CA 92110 Telephone - (619) 543-5109 FAX No. - (619) 543-5108
Districts 07 and 08; in San Luis Obispo and Santa Barbara Counties in District 05; and in Kern County in District 06:	Districts 01, 02, 03 and 09:
Triaxial Management Services, Inc. - Los Angeles 2594 Industry Way, Suite 101 Lynwood, CA 90262 Telephone - (310) 537-6677 FAX No. - (310) 637-0128	Triaxial Management Services, Inc. - Sacramento 930 Alhambra Blvd., #205 Sacramento, CA 95816 Telephone - (916) 553-4172 FAX No. - (916) 553-4173

2-1.02B SUBMISSION OF DBE INFORMATION

The required DBE information shall be submitted on the "CALTRANS BIDDER - DBE INFORMATION" form included in the Proposal. If the DBE information is not submitted with the bid, the DBE Information form shall be removed from the documents prior to submitting the bid.

It is the bidder's responsibility to make enough work available to DBEs and to select those portions of the work or material needs consistent with the available DBEs to meet the goal for DBE participation or to provide information to establish that, prior to bidding, the bidder made adequate good faith efforts to do so.

If DBE information is not submitted with the bid, the apparent successful bidder (low bidder), the second low bidder and the third low bidder shall submit DBE information to the Department of Transportation, 1120 N Street, Room 0200, MS #26, Sacramento, California 95814 so the information is received by the Department no later than 4:00 p.m. on the fourth day, not including Saturdays, Sundays and legal holidays, following bid opening. DBE information sent by U.S. Postal Service certified mail with return receipt and certificate of mailing and mailed on or before the third day, not including Saturdays, Sundays and legal holidays, following bid opening will be accepted even if it is received after the fourth day following bid opening. Failure to submit the required DBE information by the time specified will be grounds for finding the bid or proposal nonresponsive. Other bidders need not submit DBE information unless requested to do so by the Department.

The bidder's DBE information shall establish that good faith efforts to meet the DBE goal have been made. To establish good faith efforts, the bidder shall demonstrate that the goal will be met or that, prior to bidding, adequate good faith efforts to meet the goal were made.

Bidders are cautioned that even though their submittal indicates they will meet the stated DBE goal, their submittal should also include their adequate good faith efforts information along with their DBE goal information to protect their eligibility for award of the contract in the event the Department, in its review, finds that the goal has not been met.

The bidder's DBE information shall include the names, addresses and phone numbers of DBE firms that will participate, with a complete description of work or supplies to be provided by each, the dollar value of each DBE transaction, and a written confirmation from the DBE that it is participating in the contract. A copy of the DBE's quote will serve as written

confirmation that the DBE is participating in the contract. When 100 percent of a contract item of work is not to be performed or furnished by a DBE, a description of the exact portion of that work to be performed or furnished by that DBE shall be included in the DBE information, including the planned location of that work. The work that a DBE prime contractor has committed to performing with its own forces as well as the work that it has committed to be performed by DBE subcontractors, suppliers and trucking companies will count toward the goal.

The information necessary to establish the bidder's adequate good faith efforts to meet the DBE goal should include:

- A. The names and dates of each publication in which a request for DBE participation for this project was placed by the bidder.
- B. The names and dates of written notices sent to certified DBEs soliciting bids for this project and the dates and methods used for following up initial solicitations to determine with certainty whether the DBEs were interested.
- C. The items of work which the bidder made available to DBE firms, including, where appropriate, any breaking down of the contract work items (including those items normally performed by the bidder with its own forces) into economically feasible units to facilitate DBE participation. It is the bidder's responsibility to demonstrate that sufficient work to meet the DBE goal was made available to DBE firms.
- D. The names, addresses and phone numbers of rejected DBE firms, the firms selected for that work, and the reasons for the bidder's choice.
- E. Efforts made to assist interested DBEs in obtaining bonding, lines of credit or insurance, and any technical assistance or information related to the plans, specifications and requirements for the work which was provided to DBEs.
- F. Efforts made to assist interested DBEs in obtaining necessary equipment, supplies, materials, or related assistance or services, excluding supplies and equipment the DBE subcontractor purchases or leases from the prime contractor or its affiliate.
- G. The names of agencies contacted to provide assistance in contacting, recruiting and using DBE firms.
- H. Any additional data to support a demonstration of good faith efforts.

2-1.03 BRIDGE CONSTRUCTION INFORMATION/QUESTIONNAIRE

The Department has established the need to obtain information regarding each bidder's qualifications for performing bridge construction work contracts.

Bidders shall submit responses to the "Bridge Construction Information/Questionnaire" included in the Proposal. The responses to the Questionnaire shall be submitted with the bid.

In signing the signature page of the Proposal, the bidder certifies that the information and answers on the "Bridge Construction Information/Questionnaire" are complete and accurate.

2-1.04 ESCROW OF BID DOCUMENTATION

Bid documentation shall consist of all documentary and calculated information generated by the Contractor in preparation of the bid. The bid documentation shall conform to the requirements in these special provisions, and shall be submitted to the Department and held in escrow for the duration of the contract.

In the resolution of disputes involving the project, the escrowed bid documents will be the only documents accepted from the Contractor regarding preparation of the bid.

In signing the proposal, the bidder certifies that the material submitted for escrow constitutes all the documentary information used in preparation of the bid and that he has personally examined the contents of the container and that they are complete.

Nothing in the bid documentation shall be construed to change or modify the terms or conditions of the contract.

Escrowed bid documentation will not be used for pre-award evaluation of the Contractor's anticipated methods of construction, nor to assess the Contractor's qualifications for performing the work.

Bid documentation shall clearly itemize the Contractor's estimated costs of performing the work. The documentation submitted shall be complete and so detailed as to allow for an in-depth analysis of the Contractor's estimate.

The bid documentation shall include, but not be limited to: quantity takeoffs; rate schedules for the direct costs and the time- and nontime-related indirect costs for labor (by craft), plant and equipment ownership and operation, permanent and expendable materials, insurance and subcontracted work; estimated construction schedules, including sequence and duration, and development of production rates; quotations from subcontractors and suppliers; estimates of field and home office overhead; contingency and margin for each contract item of work; names of the persons responsible for preparing the bidder's estimate; and other reports, calculations, assumptions, and information used by the bidder to arrive at the estimate submitted with the proposal.

The Contractor shall also submit bid documentation for each subcontractor whose total subcontract exceeds \$250,000. Subcontractor bid documentation shall be enclosed with the Contractor's submittal. The examination of subcontractors' bid documentation will be accomplished in the same manner as for the Contractor's bid documentation. If a subcontractor is

replaced, bid documentation for the new subcontractor shall be submitted for review and escrow before authorization for the substitution will be granted. Upon request of a subcontractor, the bid documentation from that subcontractor shall be reviewed only by the subcontractor and the Department.

If the bidder is a joint venture, the bid documentation shall include the joint venture agreement, the joint venture estimate comparison and final reconciliation of the joint venture estimate.

Copies of the proposals submitted by the first, second and third low bidders will be provided to the respective bidders for inclusion in the bid documentation to be escrowed.

The first, second, and third apparent low bidders shall present the bid documentation for escrow at the District 04 Office, 111 Grand Avenue, Room 12-800, Oakland, CA, on the first Monday, at 1:00 pm., following the time indicated in the "Notice to Contractors" for the opening of bids.

Bid documentation shall be submitted in a sealed container, clearly marked with the bidder's name, date of submittal, project contract number and the words, "Bid Documentation for Escrow."

Failure to submit the actual and complete bid documentation as specified herein within the time specified shall be cause for rejection of the proposal.

Upon submittal, the bid documentation of the apparent low bidder will be examined and inventoried by the duly designated representatives of the Contractor and the Department to ensure that the bid documentation is authentic, legible, and in accordance with the terms of this section "Escrow of Bid Documentation." The examination will not include review of, nor will it constitute approval of, proposed construction methods, estimating assumptions or interpretation of the contract. The examination will not alter any conditions or terms of the contract. The acceptance or rejection by the Department that the submitted bid documents are in compliance with this section "Escrow of Bid Documentation" shall be completed within 48 hours of the time the bid documentation is submitted by the Contractor.

At the completion of the examination, the bid documents will be sealed and jointly deposited at an agreed commercial bank.

Bid documentation submitted by the second and third apparent low bidders will be jointly deposited at agreed commercial banks. If the apparent low bid is withdrawn or rejected, the bid documentation of the second low bidder will be examined and inventoried in the manner specified above, then sealed and deposited again in escrow. If the second low bid is withdrawn or rejected, the bid documentation of the third low bidder will be examined and inventoried in the manner specified above, then sealed and deposited again in escrow. Upon execution and final approval of the contract or rejection of all bids, the bid documentation will be returned to any remaining unsuccessful bidders.

The escrowed bid documentation may be examined by the designated representatives of both the Department and the Contractor, at any time deemed necessary by either the Department or the Contractor to assist in the negotiation of price adjustments and change orders, or to assist in the potential resolution or settlement of claims or disputes.

If requested by a Disputes Review Board, the escrowed bid documentation may be utilized to assist the Board in its recommendations.

The bid documentation submitted by the Contractor will be held in escrow until the contract has been completed, the ultimate resolution of all disputes and claims has been achieved and receipt of final payment has been accepted by the Contractor. The escrowed bid documentation will then be released from escrow to the Contractor.

The bid documentation submitted by the bidder is, and shall remain, the property of the bidder, and is subject to only joint review by the Department and the bidder. The Department stipulates and expressly acknowledges that the submitted bid documentation constitutes trade secrets and will not be deemed public records. This acknowledgment is based on the Department's express understanding that the information contained in the bid documentation is not known outside the bidder's business, is known only to a limited extent and only by a limited number of employees of the bidder, is safeguarded while in the bidder's possession, is extremely valuable to the bidder and could be extremely valuable to the bidder's competitors by virtue of it reflecting the bidder's contemplated techniques of construction. The Department acknowledges that the bid documentation includes a compilation of information used in the bidder's business, intended to give the bidder an opportunity to obtain an advantage over competitors who do not know of or use the contents of the documentation. The Department agrees to safeguard the bid documentation, and all information contained therein, against disclosure, including disclosure of subcontractor bid documentation to the Contractor and other subcontractors to the fullest extent permitted by law. However, in the event of arbitration or litigation, the bid documentation shall be subject to discovery, and the Department assumes no responsibility for safeguarding the bid documentation unless the Contractor has obtained an appropriate protective order issued by the arbitrator or the court.

Full compensation for preparing the bid documentation, presenting it for escrow and reviewing it for escrow and upon request of the Engineer shall be considered as included in the contract prices paid for the various items of work, and no additional compensation will be allowed therefor.

The direct cost of depositing the bid documentation in escrow at the agreed commercial bank will be paid by the State.

SECTION 3. PRE-AWARD MEETING AND AWARD AND EXECUTION OF CONTRACT

3-1.01 GENERAL

The bidder's attention is directed to the provisions in Section 3, "Award and Execution of Contract," of the Standard Specifications, and these special provisions for the requirements and conditions concerning the pre-award meeting and the award and execution of contract.

3-1.01A PRE-AWARD MEETING.--Bidders are advised that on May 18, 2001 at 10:00 a.m., in the third floor conference room, 1727 - 30th Street, Sacramento, CA 95816, the apparent low bidder shall participate in a pre-award qualifications review meeting conducted by an agent of the Director. Non-attendance to the qualifications review meeting by the apparent low bidder shall be just cause for rejection of the bid and forfeiture of the proposal guaranty. At the qualifications review meeting, the low bidder shall be prepared to discuss and answer questions relative to the responses to the "Bridge Construction Information/Questionnaire" submitted with the bid. The Director's agent will prepare written findings and recommendations to the Engineer regarding award of the contract to the apparent low bidder based on the bridge construction information and responses submitted with the bid, and on the information provided at the qualifications review meeting. The Engineer's determination on the bidder's qualifications for performing bridge construction work, in a manner that is safe for the workers and the public, will be based on the bidder's experience, qualifications of on-site supervisory personnel, equipment, conceptual approach to the bridge construction work and safety history of the bidder and its supervisory personnel. The decision of the Engineer regarding the bidder's qualifications shall be final.

The second and third apparent low bidders shall participate in pre-award qualifications review meetings if requested to do so by the Department. Notification by the Department will be within 7 days after the bid opening, and will be provided at least 12 hours prior to the qualifications review meeting. Non-attendance by the second or third apparent low bidder at any such requested meeting shall be just cause for rejection of bid and forfeiture of the proposal guaranty.

3-1.01B AWARD AND EXECUTION OF CONTRACT.--The award of contract, if it be awarded, will be to the lowest responsible bidder whose proposal complies with all the requirements prescribed and who has met the goal for DBE participation or has demonstrated, to the satisfaction of the Department, good faith effort to do so and who has established to the satisfaction of the Engineer, the qualifications and ability to complete the construction work on this project in a safe and timely manner. Meeting the goal for DBE participation or demonstrating, to the satisfaction of the Department, good faith efforts to do so and establishing the qualifications and ability to complete the construction work are conditions for being eligible for award of contract.

The bidder shall bid the number of working days for it to complete All the work (except the work defined as Phase II in section 10-4.01, "Electrical Monitoring Systems") plus 240 working days for the work defined as Phase II in section 10-4.01, "Electrical Monitoring Systems." Bids in which the number of working days bid for completion of all the work (except the work defined as Phase II in section 10-4.01, "Electrical Monitoring Systems") exceed 1200 days will be considered non-responsive and will be rejected.

All bids will be compared on the basis of the Engineer's Estimate of the quantities of work to be done (TOTAL BID (A)), plus the product of the number of working days bid for completion of all the work (except the work defined as Phase II in section 10-4.01, "Electrical Monitoring Systems") and the cost per day shown on the Engineer's Estimate (TOTAL BID (B)).

The apparent lowest bid will be determined on the basis of the "Total Basis for Comparison of Bids (A + B)" set forth in the Engineer's Estimate. The contract price for the awarded contract will be the "TOTAL BID (A)" set forth in the proposal.

The amounts of the 2 bonds specified in Section 3-1.02, "Contract Bonds," of the Standard Specifications shall be based on the "Total Bid (A)" set forth on the proposal form.

It is anticipated that this contract will be awarded within 10 days after the bid opening.

The contract shall be signed by the successful bidder and shall be received with contract bonds by the Department within **4 days**, including Saturdays, Sundays and legal holidays, after the bidder has received notice that the contract has been awarded. Failure to do so shall be just cause for forfeiture of the proposal guaranty. The executed contract documents shall be delivered to the following address: Department of Transportation, P.O. Box 942874, Sacramento, CA 94274-0001, Attn: Office Engineer (MS 43)- Contracts.

Within 2 days, not including Saturdays, Sundays and legal holidays, of return of the executed contract and bonds, the Department will notify the successful bidder of either approval of the contract by the Attorney General or the attorney appointed and authorized to represent the Department of Transportation, or disapproval of the submittal. Should the Department fail to provide notification within said 2 days, the delay will be considered a right of way delay as specified in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

A "Vendor Data Record" form will be included in the contract documents to be executed by the successful bidder. The purpose of the form is to facilitate the collection of taxpayer identification data. The form shall be completed and returned to the Department by the successful bidder with the executed contract and contract bonds. For the purposes of the form, vendor

shall be deemed to mean the successful bidder. The form is not to be completed for subcontractors or suppliers. Failure to complete and return the "Vendor Data Record" form to the Department as provided herein will result in the retention of 20 percent of payments due the contractor and penalties of up to \$20,000. This retention of payments for failure to complete the "Vendor Data Record" form is in addition to any other retention of payments due the Contractor.

Attention is also directed to "Small Business Preference" of these special provisions. Any bidder who is certified as a Small Business by the Department of General Services, Office of Small Business Certification and Resources will be allowed a preference in the award of this contract, if it be awarded, under the following conditions:

(1) The apparent low bidder is not certified as a Small Business, or has not filled out and signed the Request for Small Business Preference included with the bid documents and attached a copy of their Office of Small Business Certification and Resources (OSBCR) small business certification letter to the form; and

(2) The bidder filled out and signed the Request for Small Business Preference form included with the bid documents and attached a copy of their Office of Small Business Certification and Resources (OSBCR) small business certification letter to the form.

The small business preference will be a reduction in the bid submitted by the small business contractor, for bid comparison purposes, by an amount equal to 5 percent of the amount bid by the apparent low bidder, the amount not to exceed \$50,000. If this reduction results in the small business contractor becoming the low bidder, then the contract will be awarded to the small business contractor on the basis of the actual bid of the small business contractor notwithstanding the reduced bid price used for bid comparison purposes.

Attention is also directed to "California Company Preference" of these special provisions.

The amount of the California company reciprocal preference shall be equal to the amount of the preference applied by the state of the nonresident contractor with the lowest responsive bid, except where the "California company" is eligible for a California Small Business Preference, in which case the preference applied shall be the greater of the two, but not both.

If the bidder submitting the lowest responsive bid is not a "California company" and with the benefit of the reciprocal preference, a "California company's" responsive bid is equal to or less than the original lowest responsive bid, the "California company" will be awarded the contract at its submitted bid price except as provided below.

Small business bidders shall have precedence over non-small business bidders in that the application of the "California company" preference for which non-small business bidders may be eligible shall not result in the denial of the award to a small business bidder.

SECTION 4. BEGINNING OF WORK, TIME OF COMPLETION AND LIQUIDATED DAMAGES

Attention is directed to the provisions in Section 8-1.03, "Beginning of Work," in Section 8-1.06, "Time of Completion," and in Section 8-1.07, "Liquidated Damages," and Section 10-4.01, "Electrical Monitoring Systems" of the Standard Specifications and these special provisions.

The 72 hours advance notice before beginning work as referred to in Section 8-1.03, "Beginning of Work," is changed to 24 hours advance notice for this project.

A working day as defined in Section 8-1.06 is re-defined for this project. Subparagraphs (a) and (b) of the second paragraph in Section 8-1.06 shall not apply. Saturdays, Sundays, legal holidays and days of inclement weather will be counted as working days.

The work consisting of constructing Frame 1 shall be diligently prosecuted to completion before the expiration of **900** working days beginning at 12:01 a.m. on the day after award of the contract. Attention is directed to, "Order of Work," in these special provisions with regard to Construction of Frame 1.

The Contractor shall pay to the State of California the sum of \$ 11,000 per day, for each and every calendar day's delay in completing the work consisting of constructing Frame 1 in excess of the number of working days prescribed above.

Said work (except the work defined as Phase II in Section 10-4.01, "Electrical Monitoring Systems") shall be diligently prosecuted to completion before the expiration of the number of working days bid, beginning at 12:01 a.m. on the day after award of the contract.

The Contractor shall pay to the State of California as liquidated damages the sum of **\$50,000** per day, for each and every calendar day's delay in finishing the work in excess of the number of working days bid.

The total daily amount paid by the Contractor for liquidated damages shall not exceed \$50,000 dollars per day.

The work defined as Phase II in Section 10-4.01, "Electrical Monitoring Systems" shall be diligently prosecuted to completion before the expiration of the number of working days bid plus an additional **240** working days beginning at 12:01 a.m. on the day after the day of contract award.

The Contractor shall pay to the State of California the sum of \$1,500 per day, for each and every calendar day's delay in completing the work defined as Phase II in Section 10-4.01, "Electrical Monitoring Systems" in excess of the number of working days bid plus an additional **240** working days beginning at 12:01 a.m. on the day after the day of contract award.

Delays due to actions required by the Engineer performing normal inspection, testing and review duties shall be considered as included in the number of working days bid for completion of the contract and no extensions of time will be allowed for such actions in determining liquidated damages.

Full compensation for any additional costs occasioned by compliance with the provisions in this section shall be considered as included in the prices paid for the various contract items of work and no additional compensation will be allowed therefor.

No incentive payments for early completion of all the work will be paid nor will any disincentive deductions be charged on this project.

SECTION 5. GENERAL

SECTION 5-1. MISCELLANEOUS

5-1.01 PLANS AND WORKING DRAWINGS

When the specifications require working drawings to be submitted to the Division of Structure Design, the drawings shall be submitted to: Division of Structure Design, Documents Unit, Mail Station 9, 1801 30th Street, Sacramento, CA 95816, Telephone 916 227-8252.

5-1.011 EXAMINATION OF PLANS, SPECIFICATIONS, CONTRACT, AND SITE OF WORK

The second paragraph of Section 2-1.03, "Examination of Plans, Specifications, Contract, and Site of Work," of the Standard Specifications is amended to read:

- Where the Department has made investigations of site conditions, including subsurface conditions in areas where work is to be performed under the contract, or in other areas, some of which may constitute possible local material sources, bidders or Contractors may, upon written request, inspect the records of the Department as to those investigations subject to and upon the conditions hereinafter set forth.

Attention is directed to "Differing Site Conditions" of these special provisions regarding physical conditions at the site which may differ from those indicated in "Materials Information," log of test borings or other geotechnical information obtained by the Department's investigation of site conditions.

5-1.012 DIFFERING SITE CONDITIONS

Attention is directed to Section 5-1.116, "Differing Site Conditions," of the Standard Specifications.

During the progress of the work, if subsurface or latent conditions are encountered at the site differing materially from those indicated in the "Materials Information," log of test borings, other geotechnical data obtained by the Department's investigation of subsurface conditions, or an examination of the conditions above ground at the site, the party discovering those conditions shall promptly notify the other party in writing of the specific differing conditions before they are disturbed and before the affected work is performed.

The Contractor will be allowed 15 days from the notification of the Engineer's determination of whether or not an adjustment of the contract is warranted, in which to file a notice of potential claim in conformance with the provisions of Section 9-1.04, "Notice of Potential Claim," of the Standard Specifications and as specified herein; otherwise the decision of the Engineer shall be deemed to have been accepted by the Contractor as correct. The notice of potential claim shall set forth in what respects the Contractor's position differs from the Engineer's determination and provide any additional information obtained by the Contractor, including but not limited to additional geotechnical data. The notice of potential claim shall be accompanied by the Contractor's certification that the following were made in preparation of the bid: a review of the contract, a review of the "Materials Information," a review of the log of test borings and other records of geotechnical data to the extent they were made available to bidders prior to the opening of bids, and an examination of the conditions above ground at the site. Supplementary information, obtained by the Contractor subsequent to the filing of the notice of potential claim, shall be submitted to the Engineer in an expeditious manner.

5-1.015 LABORATORY

When a reference is made in the specifications to the "Laboratory," the reference shall mean the Division of Materials Engineering and Testing Services and the Division of Structural Foundations of the Department of Transportation, or established laboratories of the various Districts of the Department, or other laboratories authorized by the Department to test materials and work involved in the contract. When a reference is made in the specifications to the "Transportation Laboratory," the reference shall mean the Division of Materials Engineering and Testing Services and the Division of Structural Foundations, located at 5900 Folsom Boulevard, Sacramento, CA 95819, Telephone (916) 227-7000.

5-1.017 CONTRACT BONDS

Attention is directed to Section 3-1.02, "Contract Bonds," of the Standard Specifications and these special provisions.

The payment bond shall be in a sum not less than one hundred percent of the total amount payable by the terms of the contract.

5-1.018 EXCAVATION SAFETY PLANS

Section 5-1.02A, "Trench Excavation Safety Plans," of the Standard Specifications is amended to read:

5-1.02A Excavation Safety Plans

- The Construction Safety Orders of the Division of Occupational Safety and Health shall apply to all excavations. For all excavations 1.5 m or more in depth, the Contractor shall submit to the Engineer a detailed plan showing the design and details of the protective systems to be provided for worker protection from the hazard of caving ground during excavation. The detailed plan shall include any tabulated data and any design calculations used in the preparation of the plan. Excavation shall not begin until the detailed plan has been reviewed and approved by the Engineer.
- Detailed plans of protective systems for which the Construction Safety Orders require design by a registered professional engineer shall be prepared and signed by an engineer who is registered as a Civil Engineer in the State of California, and shall include the soil classification, soil properties, soil design calculations that demonstrate adequate stability of the protective system, and any other design calculations used in the preparation of the plan.
- No plan shall allow the use of a protective system less effective than that required by the Construction Safety Orders.
- If the detailed plan includes designs of protective systems developed only from the allowable configurations and slopes, or Appendices, contained in the Construction Safety Orders, the plan shall be submitted at least 5 days before the Contractor intends to begin excavation. If the detailed plan includes designs of protective systems developed from tabulated data, or designs for which design by a registered professional engineer is required, the plan shall be submitted at least 3 weeks before the Contractor intends to begin excavation.
- Attention is directed to Section 7-1.01E, "Trench Safety."

The third paragraph of Section 19-1.02, "Preservation of Property," of the Standard Specifications is amended to read:

- In addition to the provisions in Sections 5-1.02, "Plans and Working Drawings," and 5-1.02A, "Excavation Safety Plans," detailed plans of the protective systems for excavations on or affecting railroad property will be reviewed for adequacy of protection provided for railroad facilities, property, and traffic. These plans shall be submitted at least 9 weeks before the Contractor intends to begin excavation requiring the protective systems. Approval by the Engineer of the detailed plans for the protective systems will be contingent upon the plans being satisfactory to the railroad company involved.

5-1.019 COST REDUCTION INCENTIVE

Attention is directed to Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications.

Prior to preparing a cost reduction proposal, the Contractor shall request a meeting with the Engineer to discuss the proposal in concept and to determine the merit of the cost reduction proposal. Items of discussion will also include permit issues, impact on other projects, impact on the project schedule, peer reviews, and review times required by the Department and other agencies.

5-1.02 LABOR NONDISCRIMINATION

Attention is directed to the following Notice that is required by Chapter 5 of Division 4 of Title 2, California Code of Regulations.

NOTICE OF REQUIREMENT FOR NONDISCRIMINATION PROGRAM

(GOV. CODE, SECTION 12990)

Your attention is called to the "Nondiscrimination Clause", set forth in Section 7-1.01A(4), "Labor Nondiscrimination," of the Standard Specifications, which is applicable to all nonexempt State contracts and subcontracts, and to the "Standard California Nondiscrimination Construction Contract Specifications" set forth therein. The specifications are applicable to all nonexempt State construction contracts and subcontracts of \$5000 or more.

5-1.03 INTEREST ON PAYMENTS

Interest shall be payable on progress payments, payments after acceptance, final payments, extra work payments, and claim payments as follows:

- A. Unpaid progress payments, payment after acceptance, and final payments shall begin to accrue interest 30 days after the Engineer prepares the payment estimate.
- B. Unpaid extra work bills shall begin to accrue interest 30 days after preparation of the first pay estimate following receipt of a properly submitted and undisputed extra work bill. To be properly submitted, the bill must be submitted within 7 days of the performance of the extra work and in conformance with the provisions in Section 9-1.03C, "Records," and Section 9-1.06, "Partial Payments," of the Standard Specifications. An undisputed extra work bill not submitted within 7 days of performance of the extra work will begin to accrue interest 30 days after the preparation of the second pay estimate following submittal of the bill.
- C. The rate of interest payable for unpaid progress payments, payments after acceptance, final payments, and extra work payments shall be 10 percent per annum.
- D. The rate of interest payable on a claim, protest or dispute ultimately allowed under this contract shall be 6 percent per annum. Interest shall begin to accrue 61 days after the Contractor submits to the Engineer information in sufficient detail to enable the Engineer to ascertain the basis and amount of said claim, protest or dispute.

The rate of interest payable on any award in arbitration shall be 6 percent per annum if allowed under the provisions of Civil Code Section 3289.

5-1.031 FINAL PAYMENT AND CLAIMS

Attention is directed to Section 9-1.07B, "Final Payment and Claims," of the Standard Specifications.

The District that administers the contract shall submit a claim position letter to the Contractor within 135 days after acceptance of the contract. After receipt of the claim position letter from the District, or 135 days after acceptance of the contract, whichever occurs first, the Contractor may request a meeting with the person or board designated by the District Director to review claims that remain in dispute. If the Contractor requests a meeting, the review person or board shall meet with the Contractor within 45 days after the request is received.

5-1.04 PUBLIC SAFETY

The Contractor shall provide for the safety of traffic and the public in conformance with the provisions in Section 7-1.09, "Public Safety," of the Standard Specifications and these special provisions.

The Contractor shall install temporary railing (Type K) between a lane open to public traffic and an excavation, obstacle or storage area when the following conditions exist:

- A. Excavations.—The near edge of the excavation is 3.6 m or less from the edge of the lane, except:
 - 1. Excavations covered with sheet steel or concrete covers of adequate thickness to prevent accidental entry by traffic or the public.
 - 2. Excavations less than 0.3-m deep.
 - 3. Trenches less than 0.3-m wide for irrigation pipe or electrical conduit, or excavations less than 0.3-m in diameter.
 - 4. Excavations parallel to the lane for the purpose of pavement widening or reconstruction.
 - 5. Excavations in side slopes, where the slope is steeper than 1:4 (vertical:horizontal).
 - 6. Excavations protected by existing barrier or railing.
- B. Temporarily Unprotected Permanent Obstacles.—The work includes the installation of a fixed obstacle together with a protective system, such as a sign structure together with protective railing, and the Contractor elects to install the obstacle prior to installing the protective system; or the Contractor, for the Contractor's convenience and with permission of the Engineer, removes a portion of an existing protective railing at an obstacle and does not replace such railing complete in place during the same day.
- C. Storage Areas.—Material or equipment is stored within 3.6 m of the lane and the storage is not otherwise prohibited by the provisions of the Standard Specifications and these special provisions.

The approach end of temporary railing (Type K), installed in conformance with the provisions in this section "Public Safety" and in Section 7-1.09, "Public Safety," of the Standard Specifications, shall be offset a minimum of 4.6 m from the edge of the traffic lane open to public traffic. The temporary railing shall be installed on a skew toward the edge of the traffic lane of not more than 0.3-m transversely to 3 m longitudinally with respect to the edge of the traffic lane. If the 4.6-m

minimum offset cannot be achieved, the temporary railing shall be installed on the 10 to 1 skew to obtain the maximum available offset between the approach end of the railing and the edge of the traffic lane, and an array of temporary crash cushion modules shall be installed at the approach end of the temporary railing.

Temporary railing (Type K) shall conform to the provisions in Section 12-3.08, "Temporary Railing (Type K)," of the Standard Specifications. Temporary railing (Type K), conforming to the details shown on 1999 Standard Plan T3, may be used. Temporary railing (Type K) fabricated prior to January 1, 1993, and conforming to 1988 Standard Plan B11-30 may be used, provided the fabrication date is printed on the required Certificate of Compliance.

Temporary crash cushion modules shall conform to the provisions in "Temporary Crash Cushion Module" of these special provisions.

Except for installing, maintaining and removing traffic control devices, whenever work is performed or equipment is operated in the following work areas, the Contractor shall close the adjacent traffic lane unless otherwise provided in the Standard Specifications and these special provisions:

Approach Speed of Public Traffic (Posted Limit) (Kilometers Per Hour)	Work Areas
Over 72 (45 Miles Per Hour)	Within 1.8 m of a traffic lane but not on a traffic lane
56 to 72 (35 to 45 Miles Per Hour)	Within 0.9-m of a traffic lane but not on a traffic lane

The lane closure provisions of this section shall not apply if the work area is protected by permanent or temporary railing or barrier.

When traffic cones or delineators are used to delineate a temporary edge of a traffic lane, the line of cones or delineators shall be considered to be the edge of the traffic lane, however, the Contractor shall not reduce the width of an existing lane to less than 3 m without written approval from the Engineer.

When work is not in progress on a trench or other excavation that required closure of an adjacent lane, the traffic cones or portable delineators used for the lane closure shall be placed off of and adjacent to the edge of the traveled way. The spacing of the cones or delineators shall be not more than the spacing used for the lane closure.

Suspended loads or equipment shall not be moved nor positioned over public traffic or pedestrians.

Full compensation for conforming to the provisions in this section "Public Safety," including furnishing and installing temporary railing (Type K) and temporary crash cushion modules, shall be considered as included in the contract prices paid for the various items of work involved and no additional compensation will be allowed therefor.

5-1.05 SURFACE MINING AND RECLAMATION ACT

Attention is directed to the Surface Mining and Reclamation Act of 1975, commencing in Public Resources Code, Mining and Geology, Section 2710, which establishes regulations pertinent to surface mining operations, and to California Public Contract Code Section 10295.5.

Material from mining operations furnished for this project shall only come from permitted sites in compliance with California Public Contract Code Section 10295.5.

The requirements of this section shall apply to materials furnished for the project, except for acquisition of materials in conformance with the provisions in Section 4-1.05, "Use of Materials Found on the Work," of the Standard Specifications.

5-1.06 REMOVAL OF ASBESTOS AND HAZARDOUS SUBSTANCES

When the presence of asbestos or hazardous substances are not shown on the plans or indicated in the specifications and the Contractor encounters materials which the Contractor reasonably believes to be asbestos or a hazardous substance as defined in Section 25914.1 of the Health and Safety Code, and the asbestos or hazardous substance has not been rendered harmless, the Contractor may continue work in unaffected areas reasonably believed to be safe. The Contractor shall immediately cease work in the affected area and report the condition to the Engineer in writing.

In conformance with Section 25914.1 of the Health and Safety Code, removal of asbestos or hazardous substances including exploratory work to identify and determine the extent of the asbestos or hazardous substance will be performed by separate contract.

If delay of work in the area delays the current controlling operation, the delay will be considered a right of way delay and the Contractor will be compensated for the delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

5-1.07 YEAR 2000 COMPLIANCE

This contract is subject to Year 2000 Compliance for automated devices in the State of California.

Year 2000 compliance for automated devices in the State of California is achieved when embedded functions have or create no logical or mathematical inconsistencies when dealing with dates prior to and beyond 1999. The year 2000 is

recognized and processed as a leap year. The product shall operate accurately in the manner in which the product was intended for date operation without requiring manual intervention.

The Contractor shall provide the Engineer a Certificate of Compliance from the manufacturer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for all automated devices furnished for the project.

5-1.075 BUY AMERICA REQUIREMENTS

Attention is directed to the "Buy America" requirements of the Surface Transportation Assistance Act of 1982 (Section 165) and the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) Sections 1041(a) and 1048(a), and the regulations adopted pursuant thereto. In conformance with the law and regulations, all manufacturing processes for steel and iron materials furnished for incorporation into the work on this project shall occur in the United States; with the exception that pig iron and processed, pelletized and reduced iron ore manufactured outside of the United States may be used in the domestic manufacturing process for such steel and iron materials. The application of coatings, such as epoxy coating, galvanizing, painting, and other coatings that protect or enhance the value of steel or iron materials shall be considered a manufacturing process subject to the "Buy America" requirements.

A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications shall be furnished for steel and iron materials. The certificates, in addition to certifying that the materials comply with the specifications, shall specifically certify that all manufacturing processes for the materials occurred in the United States, except for the above exceptions.

The requirements imposed by the law and regulations do not prevent a minimal use of foreign steel and iron materials if the total combined cost of the materials used does not exceed one-tenth of one percent (0.1 percent) of the total contract cost or \$2500, whichever is greater. The Contractor shall furnish the Engineer acceptable documentation of the quantity and value of the foreign steel and iron prior to incorporating the materials into the work.

5-1.08 SUBCONTRACTOR AND DBE RECORDS

The Contractor shall maintain records showing the name and business address of each first-tier subcontractor. The records shall also show the name and business address of every DBE subcontractor, DBE vendor of materials and DBE trucking company, regardless of tier. The records shall show the date of payment and the total dollar figure paid to all of these firms. DBE prime contractors shall also show the date of work performed by their own forces along with the corresponding dollar value of the work.

Upon completion of the contract, a summary of these records shall be prepared on Form CEM-2402 (F) and certified correct by the Contractor or the Contractor's authorized representative, and shall be furnished to the Engineer. The form shall be furnished to the Engineer within 90 days from the date of contract acceptance. \$10,000 will be withheld from payment until the Form CEM-2402 (F) is submitted. The amount will be returned to the Contractor when a satisfactory Form CEM-2402 (F) is submitted.

Prior to the fifteenth of each month, the Contractor shall submit documentation to the Engineer showing the amount paid to DBE trucking companies listed in the Contractor's DBE information. This monthly documentation shall indicate the portion of the revenue paid to DBE trucking companies which is claimed toward DBE participation. The Contractor shall also obtain and submit documentation to the Engineer showing the amount paid by DBE trucking companies to all firms, including owner-operators, for the leasing of trucks. The DBE who leases trucks from a non-DBE is entitled to credit only for the fee or commission it receives as a result of the lease arrangement. The records must confirm that the amount of credit claimed toward DBE participation conforms with Section 2-1.02, "Disadvantaged Business Enterprise," of these special provisions.

The Contractor shall also obtain and submit documentation to the Engineer showing the truck number, owner's name, California Highway Patrol CA number, and if applicable, the DBE certification number of the owner of the truck for all trucks used during that month for which DBE participation will be claimed. This documentation shall be submitted on Form CEM-2404 (F).

5-1.083 DBE CERTIFICATION STATUS

If a DBE subcontractor is decertified during the life of the project, the decertified subcontractor shall notify the Contractor in writing with the date of decertification. If a subcontractor becomes a certified DBE during the life of the project, the subcontractor shall notify the Contractor in writing with the date of certification. The Contractor shall furnish the written documentation to the Engineer.

Upon completion of the contract, Form CEM-2403 (F) indicating the DBE's existing certification status shall be signed and certified correct by the Contractor. The certified form shall be furnished to the Engineer within 90 days from the date of contract acceptance.

5-1.086 PERFORMANCE OF DBE SUBCONTRACTORS AND SUPPLIERS

The DBEs listed by the Contractor in response to the provisions in Section 2-1.02B, "Submission of DBE Information," and Section 3, "Award and Execution of Contract," of these special provisions, which are determined by the Department to be certified DBEs, shall perform the work and supply the materials for which they are listed, unless the Contractor has received prior written authorization to perform the work with other forces or to obtain the materials from other sources.

Authorization to use other forces or sources of materials may be requested for the following reasons:

- A. The listed DBE, after having had a reasonable opportunity to do so, fails or refuses to execute a written contract, when such written contract, based upon the general terms, conditions, plans and specifications for the project, or on the terms of such subcontractor's or supplier's written bid, is presented by the Contractor.
- B. The listed DBE becomes bankrupt or insolvent.
- C. The listed DBE fails or refuses to perform the subcontract or furnish the listed materials.
- D. The Contractor stipulated that a bond was a condition of executing a subcontract and the listed DBE subcontractor fails or refuses to meet the bond requirements of the Contractor.
- E. The work performed by the listed subcontractor is substantially unsatisfactory and is not in substantial conformance with the plans and specifications, or the subcontractor is substantially delaying or disrupting the progress of the work.
- F. It would be in the best interest of the State.

The Contractor shall not be entitled to any payment for such work or material unless it is performed or supplied by the listed DBE or by other forces (including those of the Contractor) pursuant to prior written authorization of the Engineer.

5-1.09 SUBCONTRACTING

Attention is directed to the provisions in Section 8-1.01, "Subcontracting," of the Standard Specifications, and Section 2, "Proposal Requirements and Conditions," and Section 3, "Award and Execution of Contract," of these special provisions.

Pursuant to the provisions of Section 1777.1 of the Labor Code, the Labor Commissioner publishes and distributes a list of contractors ineligible to perform work as a subcontractor on a public works project. This list of debarred contractors is available from the Department of Industrial Relations web site at:

<http://www.dir.ca.gov/DLSE/Debar.html>.

The provisions in the third paragraph of Section 8-1.01, "Subcontracting," of the Standard Specifications, that the Contractor shall perform with the Contractor's own organization contract work amounting to not less than 50 percent of the original contract price, is not changed by the Federal Aid requirement specified under "Required Contract Provisions Federal-Aid Construction Contracts" in Section 14 of these special provisions that the Contractor perform not less than 30 percent of the original contract work with the Contractor's own organization.

Each subcontract and any lower tier subcontract that may in turn be made shall include the "Required Contract Provisions Federal-Aid Construction Contracts" in Section 14 of these special provisions. This requirement shall be enforced as follows:

- A. Noncompliance shall be corrected. Payment for subcontracted work involved will be withheld from progress payments due, or to become due, until correction is made. Failure to comply may result in termination of the contract.

In conformance with the Federal DBE regulations Sections 26.53(f)(1) and 26.53(f)(2) Part 26, Title 49 CFR:

- A. The Contractor shall not terminate for convenience a DBE subcontractor listed in response to Section 2-1.02B, "Submission of DBE Information," and then perform that work with its own forces, or those of an affiliate without the written consent of the Department, and
- B. If a DBE subcontractor is terminated or fails to complete its work for any reason, the Contractor will be required to make good faith efforts to substitute another DBE subcontractor for the original DBE subcontractor, to the extent needed to meet the contract goal.

The requirement in Section 2-1.02, "Disadvantaged Business Enterprise (DBE)," of these special provisions that DBEs must be certified on the date bids are opened does not apply to DBE substitutions after award of the contract.

5-1.10 PROMPT PROGRESS PAYMENT TO SUBCONTRACTORS

Attention is directed to the provisions in Sections 10262 and 10262.5 of the Public Contract Code and Section 7108.5 of the Business and Professions Code concerning prompt payment to subcontractors.

5-1.102 PROMPT PAYMENT OF WITHHELD FUNDS TO SUBCONTRACTORS

The Contractor shall return all moneys withheld in retention from the subcontractor within 30 days after receiving payment for work satisfactorily completed, even if the other contract work is not completed and has not been accepted in conformance with Section 7-1.17, "Acceptance of Contract," of the Standard Specifications. This requirement shall not be construed to limit or impair any contractual, administrative, or judicial remedies otherwise available to the Contractor or subcontractor in the event of a dispute involving late payment or nonpayment by the Contractor or deficient subcontract performance or noncompliance by a subcontractor.

5-1.11 PARTNERING

The State will promote the formation of a "Partnering" relationship with the Contractor in order to effectively complete the contract to the benefit of both parties. The purpose of this relationship will be to maintain cooperative communication and mutually resolve conflicts at the lowest possible management level.

A one-day "Training in Partnering Concepts" forum will be conducted regardless of whether the Contractor requests the formation of a "Partnering" relationship. The forum will be conducted locally for the Contractor and the Engineer's project representatives. The Contractor shall be represented by a minimum of two representatives, one being the Contractor's authorized representative pursuant to Section 5-1.06, "Superintendence," of the Standard Specifications. If, upon the Contractor's request, "Partnering" is approved by the Engineer, "Training in Partnering Concepts" shall be conducted prior to the "Partnering" workshop. Scheduling of "Training in Partnering Concepts," selection of the Engineer's representatives to participate in "Training of Partnering Concepts," and selection of the partnering concepts trainer and site shall be as determined by the Engineer.

The Contractor may request the formation of a "Partnering" relationship by submitting a request in writing to the Engineer after approval of the contract. If the Contractor's request for "Partnering" is approved by the Engineer, scheduling of a "Partnering" workshop, selecting the "Partnering" facilitator and workshop site, and other administrative details shall be as agreed to by both parties.

The costs involved in providing a trainer and site for the "Training in Partnering Concepts" forum will be borne by the State. The Contractor shall pay all compensation for the wages and expenses of the facilitator and of the expenses for obtaining the workshop site. The State will reimburse the Contractor for these costs as extra work in conformance with the provisions in Section 4-1.03D of the Standard Specifications. Full compensation for the wages and expenses of the Contractor's representatives, including travel costs, shall be considered as included in the contract prices paid for the various items of work and no additional compensation will be allowed therefor.

The costs involved in providing a "Partnering" facilitator and a workshop site will be borne equally by the State and the Contractor. The Contractor shall pay all compensation for the wages and expenses of the facilitator and of the expenses for obtaining the workshop site. The State's share of such costs will be reimbursed to the Contractor in a change order written by the Engineer.

Markups will not be added to the costs of "Training in Partnering Concepts" or the costs of providing a "Partnering" facilitator and workshop site. All other costs associated with the "Partnering" relationship will be borne separately by the party incurring the costs.

The establishment of a "Partnering" relationship will not change or modify the terms and conditions of the contract and will not relieve either party of the legal requirements of the contract.

5-1.114 VALUE ANALYSIS

The Contractor may submit to the Engineer, in writing, a request for a "Value Analysis" workshop. The purpose for having a workshop is to identify value enhancing opportunities and to consider modifications to the plans and specifications that will reduce either the total cost, time of construction or traffic congestion, without impairing, in any manner, the essential functions or characteristics of the project including, but not limited to, service life, economy of operation, ease of maintenance, benefits to the travelling public, desired appearance, or design and safety standards.

To maximize the potential benefits of a workshop, the request should be submitted to the Engineer early in the project after approval of the contract. If the Contractor's request for a "Value Analysis" workshop is approved by the Engineer, scheduling of a workshop, selecting the facilitator and workshop site, and other administrative details shall be determined cooperatively by the Contractor and the Engineer.

The workshop shall be conducted in conformance with the methodology described in the Department's "Value Analysis Team Guide" available at the Department's web site at:

The facilitator shall be a Certified Value Specialist (CVS) as recognized by the Society of American Value Engineers (SAVE) International, which may be contacted as follows:

SAVE International, 60 Revere Drive, Northbrook, IL 60062
Telephone 1-847-480-1730, FAX 1-847-480-9282

The Contractor may submit recommendations resulting from a "Value Analysis" workshop for approval by the Engineer as cost reduction incentive proposals in conformance with the provisions in Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications.

The costs involved in providing the "Value Analysis" facilitator and workshop site will be borne equally by the State and the Contractor. The division of cost will be made by determining the cost in providing the "Value Analysis" facilitator and workshop site in conformance with the provisions in Section 9-1.03B, "Work Performed by Special Forces or Other Special Services," of the Standard Specifications, and paying to the Contractor one-half of that cost, except no markups will be allowed.

All other costs associated with the "Value Analysis" workshop will be borne separately by the party incurring the costs, such as wages and travel expenses, and no additional compensation will be allowed therefor.

5-1.12 PAYMENTS

Attention is directed to Sections 9-1.06, "Partial Payments," and 9-1.07, "Payment After Acceptance," of the Standard Specifications and these special provisions.

For the purpose of making partial payments pursuant to Section 9-1.06, "Partial Payments," of the Standard Specifications, the amount set forth for the contract items of work hereinafter listed shall be deemed to be the maximum value of the contract item of work which will be recognized for progress payment purposes:

A. Clearing and Grubbing	\$100,000.00
B. Electronic Mobile Daily Diary System Data Delivery	\$ 28,000.00

After acceptance of the contract pursuant to the provisions in Section 7-1.17, "Acceptance of Contract," of the Standard Specifications, the amount, if any, payable for a contract item of work in excess of the maximum value for progress payment purposes hereinabove listed for the item, will be included for payment in the first estimate made after acceptance of the contract.

Plate steel for fabrication of pipe piling and structural steel, stored within the state of California, and fabricated elements for structural steel, fabricated and stored within the United States, will be eligible for partial payment if the Contractor furnishes evidence satisfactory to the Engineer that its storage is subject to or under the control of the Department.

In determining the partial payments to be made to the Contractor, only the following listed materials will be considered for inclusion in the payment as materials furnished but not incorporated in the work:

- A. Progress schedule(hardware and software)
- B. Permanent Steel Casing
- C. Prestressing steel in sealed containers
- D. Prestressing ducts and anchorages
- E. Prestressing rods
- F. PTFE spherical bearings
- G. Elastomeric bumpers
- H. Joint seal assemblies
- I. Bar reinforcing steel
- J. Bar reinforcing steel(epoxy coated)
- K. Welded headed bar reinforcement
- L. Welded headed bar reinforcement (epoxy coated)
- M. Structural steel
- N. Studs in sealed boxes
- O. Corrugated steel pipe
- P. Miscellaneous metal
- Q. Bridge deck drainage system
- R. Chain link railing
- S. Tubular handrailing
- T. Fiberglass grating

- U. Fiberglass reinforced plastic doors
- V. Seismic monitoring system conduits and pullboxes
- W. Sign Structure
- X. Signal and Lighting Standards

5.1.13 FORCE ACCOUNT PAYMENT

The second, third and fourth paragraphs of Section 9-1.03A, "Work Performed by Contractor," of the Standard Specifications, shall not apply.

Attention is directed to "Progress Schedule (Critical Path) of these special provisions. To the total of the direct costs for work performed on a force account basis, computed as provided in Sections 9-1.03A(1), "Labor," 9-1.03A(2), "Materials," and 9-1.03A(3), "Equipment Rental," of the Standard Specifications, there will be added a markup of 28 percent to the cost of labor, 10 percent to the cost of materials, and 10 percent to the equipment rental. These markups shall be applied to all work performed on a force account basis, regardless of whether the work revises the current contract completion date.

The above markups, together with payments made for time related overhead pursuant to "Overhead" of these Special Provisions, shall constitute full compensation for all overhead costs for work performed on a force account basis. These overhead costs shall be deemed to include all items of expense not specifically designated as cost or equipment rental in Sections 9-1.03A(1), "Labor," 9-1.03A(2), "Materials," and 9-1.03A(3), "Equipment Rental," of the Standard Specifications. The total payment made as provided above and in the first paragraph of Section 9-1.03A, "Work Performed by Contractor," shall be deemed to be the actual cost of the work performed on a force account basis, and shall constitute full compensation therefor. Full compensation for all overhead costs for work performed on a force account basis, and for which no adjustment is made to the contract lump sum price for related overhead pursuant to "Overhead" of these Special Provisions, shall be considered as included in the markups specified above, and no additional compensation will be allowed therefor.

When extra work to be paid for on a force account basis is performed by a subcontractor, approved in accordance with the provisions in Section 8-1.01, "Subcontracting," of the Standard Specifications, an additional markup of 7 percent will be added to the total cost of that extra work including all markups specified in this section "Force Account Payment." The additional 7 percent markup shall reimburse the Contractor for additional administrative costs, and no other additional payment will be made by reason of performance of the extra work by a subcontractor.

5-1.14 RELATIONS WITH UNITED STATES FISH AND WILDLIFE SERVICE

This project is located within the jurisdiction of the U.S. Fish and Wildlife Service. The Fish and Wildlife Service has issued a Biological Opinion regarding the Delta Smelt, Harvest Mouse, Winter-Run Chinook Salmon, Steelhead, Coho Salmon, Spring-Run Chinook Salmon and Sacramento Split Tail, federal and state endangered species protected under both the federal Endangered Species Act and the California Endangered Species Act. The Department of Transportation has entered into an agreement with the Fish and Wildlife Service regarding handling of Delta Smelt, Harvest Mouse, Winter-Run Chinook Salmon, Steelhead, Coho Salmon, Spring-Run Chinook Salmon and Sacramento Split Tail at the New Benicia-Martinez Bridge Project site. The Contractor shall be fully informed of the requirements of this agreement as well as of all rules, regulations, and conditions that may govern the Contractor's operations in said area and shall conduct the Contractor's operations accordingly.

Copies of the measures for the protection of federal and state endangered species may be obtained at the Department of Transportation, Plans and Bid Documents, Room 0200, Transportation Building, 1120 N Street, P.O. Box 942874, Sacramento, California 94274-0001, Telephone No. (916) 654-4490, and are available for inspection at the office of the Toll Bridge Retrofit Program Duty Senior at District 04 Office, 111 Grand Avenue, Oakland, California 94612; telephone number (510) 286-5549, e-mail duty_senior_tollbridge_district04@dot.ca.gov.

Attention is directed to Section "Environmental Work Restrictions" of these special provisions relating to specific measures required under this contract.

Any modifications to any measures for the protection of federal and state endangered species between the Department of Transportation and the United States Fish and Wildlife Service shall be fully binding on the Contractor, and the provisions of this section shall be made a part of every subcontract executed pursuant to this contract.

Full compensation for conforming to the requirements of this section shall be considered as included in the contract prices paid for the various contract items of work and no additional compensation will be allowed therefor.

5-1.15 RELATIONS WITH NATIONAL MARINE FISHERIES SERVICE

This project is located within the jurisdiction of the National Marine Fisheries Service. The National Marine Fisheries Service has concurred with measures developed by the Department of Transportation regarding the protection of the Winter-run Chinook Salmon habitat, Delta Smelt habitat and critical habitat for the Steelhead Trout, federal and state endangered species protected under both the federal Endangered Species Act and the California Endangered Species Act. The Contractor shall be fully informed of the requirements associated with these measures as well as of all rules, regulations, and conditions

that may govern the Contractor's operations in said area and shall conduct the Contractor's operations accordingly. Attention is directed to Section "Environmental Work Restrictions" of these special provisions relating to specific measures required under this contract.

Copies of the measures for the protection of federal and state endangered species may be obtained at the Department of Transportation, Plans and Bid Documents, Room 0200, Transportation Building, 1120 N Street, P.O. Box 942874, Sacramento, California 94274-0001, Telephone No. (916) 654-4490, and are available for inspection at the office of the Toll Bridge Retrofit Program Duty Senior at District 04 Office, 111 Grand Avenue, Oakland, California 94612; telephone number (510) 286-5549, e-mail duty_senior_tollbridge_district04@dot.ca.gov.

Any modifications to any measures for the protection of federal and state endangered species between the Department of Transportation and the National Marine Fisheries Service shall be fully binding on the Contractor, and the provisions of this section shall be made a part of every subcontract executed pursuant to this contract.

Full compensation for conforming to the requirements of this section shall be considered as included in the contract prices paid for the various contract items of work and no additional compensation will be allowed therefor.

5-1.16 RELATIONS WITH U.S. ARMY CORPS OF ENGINEERS

The location of the New Benicia-Martinez Bridge Project is within an area controlled by the U.S. Army Corps of Engineers. A permit has been issued covering work to be performed under this contract. The Contractor shall be fully informed of all rules, regulations and conditions of the permit that may govern the Contractor's operations in said area and shall conduct the Contractor's work accordingly. Said document shall be considered a part of, and shall become, an integral part of the special provisions and contract for this project.

Copies of the Permit may be obtained at the Department of Transportation, Plans and Bid Documents, Room 0200, Transportation Building, 1120 N Street, P.O. Box 942874, Sacramento, California 94274-0001, Telephone No. (916) 654-4490, and are available for inspection at the Toll Bridge Program Duty Senior at District 04 Office, 111 Grand Avenue, Oakland, California 94612, telephone number (510) 286-5549, email duty_senior_tollbridge_district04@dot.ca.gov.

Any modifications to the permit which are proposed by the Contractor shall be submitted in writing to the Engineer for transmittal to the Army Corps of Engineers for their consideration.

When the Contractor is notified by the Engineer that a modification to the permit is under consideration, no work will be allowed on the proposed modification until the Department takes action on the proposed modification. Any modifications to any agreement between the Department of Transportation and the Army Corps of Engineers shall be fully binding on the Contractor, and the provisions of this section shall be made a part of every subcontract executed pursuant to this contract.

Full compensation for conforming to the requirements of this section shall be considered as included in the contract prices paid for the various contract items of work and no additional compensation will be allowed therefor.

5-1.17 RELATIONS WITH SAN FRANCISCO BAY CONSERVATION DEVELOPMENT COMMISSION (BCDC)

The location of the New Benicia-Martinez Bridge Project is within an area controlled by the BCDC. Permit No. 17-99(M) has been issued covering work to be performed under this contract. The Contractor shall be fully informed of all rules, regulations and conditions of the permit that may govern the Contractor's operations in said area and shall conduct the Contractor's work accordingly. Said document shall be considered a part of, and shall become, an integral part of the special provisions and contract for this project.

Copies of the Permit may be obtained at the Department of Transportation, Plans and Bid Documents, Room 0200, Transportation Building, 1120 N Street, P.O. Box 942874, Sacramento, California 94274-0001, Telephone No. (916) 654-4490, and are available for inspection at the office of the Toll Bridge Retrofit Program Duty Senior at District 04 Office, 111 Grand Avenue, Oakland, California 94612; telephone number (510) 286-5549, e-mail duty_senior_tollbridge_district04@dot.ca.gov.

Any modifications to the permit which are proposed by the Contractor shall be submitted in writing to the Engineer for transmittal to the BCDC for their consideration.

When the Contractor is notified by the Engineer that a modification to the permit is under consideration, no work will be allowed on the proposed modification until the Department takes action on the proposed modification. Any modifications to any agreement between the Department of Transportation and BCDC shall be fully binding on the Contractor, and the provisions of this section shall be made a part of every subcontract executed pursuant to this contract.

Full compensation for conforming to the above requirements shall be considered as included in the contract prices paid for the various contract items of work and no additional compensation will be allowed therefor.

5-1.18 RELATIONS WITH U.S. COAST GUARD

The location of the bridge work is adjacent to and across a navigable channel which is under the jurisdiction of the U.S. Coast Guard, Eleventh District, Bridge Section, Bldg. 50-6, Coast Guard Island, Alameda, CA 94501.

Attention is directed to Sections 7-1.01, "Laws To Be Observed," and 7-1.11, "Preservation of Property," of the Standard Specifications.

Attention is directed to the "Coast Guard Checklist" requirements concerning anchoring and setting anchors in the vicinity of the oil pipeline located between the existing rail road bridge and the new construction.

The Contractor shall comply with all requirements of the U.S. Coast Guard with regard to the manner in which he conducts his operations and disposes of material. Any restriction of the channel and all navigation and warning lights shall be in accordance with regulations and subject to the approval of the U.S. Coast Guard. The Contractor's attention is directed to the need for:

- C. Navigation light coordination with the flashing beacons on the adjacent rail road bridge.
- D. A sound emitting fog horn.
- E. The need for specific radar signals from the radar beacons.

Should the Contractor during the progress of the work, sink, lose, or throw overboard any material, plant or machinery, which may be dangerous to or which will obstruct navigation, he shall forthwith recover or remove such obstruction. The Contractor shall give immediate notice to the proper authorities and if required shall mark or buoy such obstructions until they are removed.

Material from the work shall not be disposed of in the channel, except as allowed elsewhere in these special provisions.

The Contractor shall keep proper warning lights each night between the hours of sunset and sunrise upon all floating equipment and falsework connected with the work and upon all buoys which are of a size and in such location as to endanger or obstruct navigation.

All work shall be so conducted that the free navigation of the waterway shall not be interfered with and the present navigable depths and channel width shall not be impaired.

Openings shall be provided beneath the segmental construction for use of ship traffic at each location where required by the Coast Guard. The minimum width and height at each location shall conform to the requirements in the following table. The width shall be the clear width between fenders or other protective work. The lowest elevation is the elevation below which there shall be no obstruction within the stated width.

	Required Ship Navigation Openings		
Location	Name	Lowest Elevation	Minimum Width (m)
Span 7	Main Shipping Channel	Elev. 42.1 m ¹	110 m*
Span 8	Alternate Shipping Channel	Elev. 42.1 m ¹	90 m*

*-To be confirmed in final Coast Guard Permit

1- Elevation based on NGVD 1929

The Contractor's operations shall be conducted in such a manner that the Rail Road movable span may be opened at any time for the passage of navigation.

The Contractor shall promptly install and place in operation suitable temporary navigation lighting as required by the Coast Guard. Such lighting shall be maintained in operation until the permanent navigation lighting equipment is in operation.

Full compensation for conforming with the requirements of this section shall be considered as included in the contract prices paid for the various items of work and no additional compensation will be allowed therefor.

5-1.19 RELATIONS WITH CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD

The location of the New Benicia-Martinez Bridge Project is within an area controlled by the Regional Water Quality Control Board. Regional Water Quality Control Board Order No. 2118.03 has been issued covering work to be performed under this contract. The Contractor shall be fully informed of all rules, regulations and conditions that may govern the Contractor's operations in said area and shall conduct the Contractor's work accordingly.

Copies of the order may be obtained at the Department of Transportation, Plans and Bid Documents, Room 0200, Transportation Building, 1120 N Street, P.O. Box 942874, Sacramento, California 94274-0001, Telephone No. (916) 654-4490, and are available for inspection at the office of the Toll Bridge Retrofit Program Duty Senior at District 04 Office, 111 Grand Avenue, Oakland, California 94612; telephone number (510) 286-5549, e-mail duty_senior_tollbridge_district04@dot.ca.gov.

Attention is directed to Sections 7-1.11, "Preservation of Property," and 7-1.12, "Indemnification And Insurance," of the Standard Specifications.

Attention is directed to Section 8-1.06, "Time of Completion," of the Standard Specifications. Days during which the Contractor's operations are restricted in the floodway by the requirements of this section, shall be considered to be nonworking days if these restrictions cause a delay in the current controlling operation or operations.

Any modifications to the order which are proposed by the Contractor shall be submitted in writing to the Engineer for transmittal to the Regional Water Quality Control Board for their consideration.

When the Contractor is notified by the Engineer that a modification to the permit is under consideration, no work will be allowed on the proposed modification until the Department takes action on the proposed modification.

Any modifications to any agreement between the Department of Transportation and the Regional Water Quality Control Board shall be fully binding on the Contractor, and the provisions of this section shall be made a part of every subcontract executed pursuant to this contract.

Full compensation for conforming to the requirements of this section shall be considered as included in the contract prices paid for the various contract items of work and no additional compensation will be allowed therefor.

5-1.20 DISPUTE REVIEW BOARD

To assist in the resolution of disputes or potential claims arising out of the work of this project, a Dispute Review Board, hereinafter referred to as the "DRB," shall be established by the Engineer and Contractor cooperatively upon approval of the contract. The DRB is intended to assist the contract administrative claims resolution process as specified in the provisions in Section 9-1.04, "Notice of Potential Claim," and Section 9-1.07B, "Final Payment and Claims," of the Standard Specifications. The DRB shall not serve as a substitute for provisions in the specifications in regard to filing potential claims. The requirements and procedures established in this special provision shall be considered as an essential prerequisite to filing a claim, for arbitration or for litigation prior or subsequent to project completion.

The DRB shall be utilized when dispute or potential claim resolution at the project level is unsuccessful. The DRB shall function until the day of acceptance of the contract, at which time the work of the DRB will cease except for completion of unfinished dispute hearings and reports. After acceptance of the contract, disputes or potential claims that the Contractor wants to pursue that have not been settled, shall be stated or restated, by the Contractor, in response to the Proposed Final Estimate within the time limits provided in Section 9-1.07B, "Final Payment and Claims," of the Standard Specifications. The State will review those claims in conformance with the provisions in Section 9-1.07B of the Standard Specifications. Following the completion of the State's administrative claims procedure, the Contractor may resort to arbitration in conformance with the provisions in Section 9-1.10, "Arbitration," of the Standard Specifications.

Disputes, as used in this section, shall include differences of opinion, properly noticed as provided hereinafter, between the State and Contractor on matters related to the work and other subjects considered by the State or Contractor, or by both, to be of concern to the DRB on this project, except matters relating to Contractor, subcontractor or supplier claims not actionable against the State as specified in these special provisions. Whenever the term "dispute" or "disputes" is used herein, it shall be deemed to include potential claims as well as disputes.

The DRB shall serve as an advisory body to assist in the resolution of disputes between the State and the Contractor, hereinafter referred to as the "parties." The DRB shall consider disputes referred to it, and furnish written reports containing findings and recommendations pertaining to those disputes, to the parties to aid in resolution of the differences between them. DRB findings and recommendations are not binding on the parties.

The DRB shall consist of one member selected by the State, one member selected by the Contractor, and a third member selected by the first 2 members and approved by both the State and the Contractor. The third member shall act as DRB Chairperson.

The first 2 DRB members shall select a third DRB member subject to mutual approval of the parties or may mutually concur on a list of potentially acceptable third DRB members and submit the list to the parties for final selection and approval of the third member. The goal in selection of the third member is to complement the professional experience of the first 2 members and to provide leadership for the DRB's activities.

No DRB member shall have prior direct involvement in this contract. No member shall have a financial interest in this contract or the parties thereto, within a period of 6 months prior to award of this contract or during the contract, except as follows:

- A. Compensation for services on this DRB.
- B. Ownership interest in a party or parties, documented by the prospective DRB member, that has been reviewed and determined in writing by the State to be sufficiently insignificant to render the prospective member acceptable to the State.
- C. Service as a member of other Dispute Review Boards on other contracts.
- D. Retirement payments or pensions received from a party that are not tied to, dependent on or affected by the net worth of the party.

- E. The above provisions apply to parties having a financial interest in this contract, including but not limited to contractors, subcontractors, suppliers, consultants, and legal and business services.

DRB members shall be especially knowledgeable in segmental cantilevered cast-in-place bridge construction, large marine type foundation construction and the type of construction and contract documents potentially anticipated by the contract. The members shall discharge their responsibilities impartially and as an independent body considering the facts and circumstances related to the matters under consideration, applicable laws and regulations, and the pertinent provisions of the contract.

The State and the Contractor shall select their respective DRB members, in conformance with the terms and conditions of the Dispute Review Board Agreement and these special provisions, within 45 days of the approval of the contract. Each party shall provide written notification to the other of the name of their selected DRB member along with the prospective member's written disclosure statement.

Before their appointments are final, the first 2 prospective DRB members shall submit complete disclosure statements to both the State and the Contractor. The statement shall include a resume of the prospective member's experience, together with a declaration describing past, present, and anticipated or planned future relationships, including indirect relationships through the prospective member's primary or full-time employer, to this project and with the parties involved in this construction contract, including, but not limited to, relevant subcontractors or suppliers to the parties, the parties' principals or the parties' counsel. The DRB members shall also include a full disclosure of close professional or personal relationships with all key members of the parties to the contract. Either the Contractor or the State may object to the others nominee and that person will not be selected for the DRB. No reason need be given for the first objection. Objections to subsequent nominees must be based on a specific breach or violation of nominee responsibilities under this specification. A different person shall then be nominated within 14 Days. The third DRB member shall supply a full disclosure statement to the first 2 DRB members and to the parties prior to appointment. Either party may reject any of the 3 prospective DRB members who fail to fully comply with all required employment and financial disclosure conditions of DRB membership as described in the Dispute Review Board Agreement and herein. A copy of the Dispute Review Board Agreement is included in this special provision.

The first duty of the State and Contractor selected members of the DRB is to select and recommend prospective third member(s) to the parties for final selection and approval. The first 2 DRB members shall proceed with the selection of the third DRB member immediately upon receiving written notification from the State of their selection, and shall provide their recommendation simultaneously to the parties within 14 days of the notification.

An impasse shall be considered to have been reached if the parties are unable to approve a third member within 14 days of receipt of the recommendation of the first 2 DRB members, or if the first 2 members are unable to agree upon a recommendation within the 14 day time limit allowed in the preceding paragraph. In the event of an impasse in selection of the third DRB member, the State and the Contractor shall each propose 3 candidates for the third position. The parties shall select the candidates proposed under this paragraph from the current list of arbitrators certified by the Public Works Contract Arbitration Committee created by Article 7.2 (commencing with Section 10245) of the State Contract Act. The first 2 DRB members shall then select one of the 6 proposed candidates in a blind draw.

The Contractor, the State, and the 3 members of the DRB shall complete and adhere to the Dispute Review Board Agreement in administration of this DRB within 14 days of the parties' concurrence in the selection of the third member. The State authorizes the Engineer to execute and administer the terms of the Agreement. The person(s) designated by the Contractor as authorized to execute Contract Change Orders shall be authorized to execute and administer the terms of this agreement, or to delegate the authority in writing. The operation of the DRB shall be in conformance with the terms of the Dispute Review Board Agreement.

The State and the Contractor shall bear the costs and expenses of the DRB equally. Each DRB board member shall be compensated at an agreed rate of \$1,000 per day if time spent per meeting, including on-site time plus one hour of travel time, is greater than 4 hours. Each DRB board member shall be compensated at an agreed rate of \$600 per day if time spent per meeting, including on-site time plus one hour of travel time, is less than or equal to 4 hours. The agreed rates shall be considered full compensation for on-site time, travel expenses, transportation, lodging, time for travel and incidentals for each day, or portion thereof, that the DRB member is at an authorized DRB meeting. No additional compensation will be made for time spent by DRB members in review and research activities outside the official DRB meetings unless that time, (such as time spent evaluating and preparing recommendations on specific issues presented to the DRB), has been specifically agreed to in advance by the State and Contractor. Time away from the project, that has been specifically agreed to in advance by the parties, will be compensated at an agreed rate of \$100 per hour. The agreed amount of \$100 per hour shall include all incidentals including expenses for telephone, fax, and computer services. Members serving on more than one DRB, regardless of the number of meetings per day, shall not be paid more than the all inclusive rate per day or rate per hour for an individual project. The State will provide, at no cost to the Contractor, administrative services such as conference facilities and secretarial services to the DRB. These special provisions and the Dispute Review Board Agreement state provisions for compensation and expenses of the DRB. DRB members shall be compensated at the same daily and hourly rate. The Contractor shall make direct payments to each DRB member for their participation in authorized meetings and

approved hourly rate charges from invoices submitted by each DRB member. The State will reimburse the Contractor for its share of the costs. There will be no markups applied to expenses connected with the DRB, either by the DRB members or by the Contractor when requesting payment of the State's share of DRB expenses.

Service of a DRB member may be terminated at any time with not less than 14 days notice as follows:

- A. The State may terminate service of the State appointed member.
- B. The Contractor may terminate service of the Contractor appointed member.
- C. Upon the written recommendation of the State and Contractor members for the removal of the third member.
- D. Upon resignation of a member.

When a member of the DRB is replaced, the replacement member shall be appointed in the same manner as the replaced member was appointed. The appointment of a replacement DRB member will begin promptly upon determination of the need for replacement and shall be completed within 14 days. Changes in either of the DRB members chosen by the two parties will not require re-selection of the third member, unless both parties agree to such re-selection in writing. The Dispute Review Board Agreement shall be amended to reflect the change of a DRB member.

The following procedure shall be used for dispute resolution:

- A. If the Contractor objects to any decision, act or order of the Engineer, the Contractor shall give written notice of potential claim in conformance with the provisions in Section 9-1.04, "Notice of Potential Claim," of the Standard Specifications, including provision of applicable cost documentation; or file written protests or notices pursuant to Section 4-1.03A, "Procedure and Protest," Section 8-1.06, "Time of Completion," Section 8-1.07, "Liquidated Damages," or Section 8-1.10, "Utility and Non-Highway Facilities," of the Standard Specifications.
- B. The Engineer will respond, in writing, to the Contractor's written protest or notice within 14 days of receipt of the written protest or notice.
- C. Within 14 days after receipt of the Engineer's written response, the Contractor shall, if the Contractor still objects, file a written reply with the Engineer, stating clearly and in detail the basis of the objection.
- D. Following the Contractor's objection to the Engineer's decision, the Contractor shall refer the dispute to the DRB if the Contractor wishes to further pursue the objection to the Engineer's decision. The Contractor shall make the referral in writing to the DRB, simultaneously copied to the State, within 21 days after receipt of the written reply from the Engineer. The written dispute referral shall describe the disputed matter in individual discrete segments so that it will be clear to both parties and the DRB what discrete elements of the dispute have been resolved, and which remain unresolved.
- E. The Contractor, by failing to submit the written notice of referral of the matter to the DRB, within 21 days after receipt of the State's written reply, waives future claims on the matter in contention.
- F. The Contractor and the State shall each be afforded an opportunity to be present and to be heard by the DRB, and to offer evidence. Either party furnishing written evidence or documentation to the DRB must furnish copies of such information to the other party a minimum of 14 days prior to the date the DRB is scheduled to convene the hearing for the dispute. Either party shall produce such additional evidence as the DRB may deem necessary to reach an understanding and determination of the dispute. The party furnishing additional evidence shall furnish copies of such additional evidence to the other party at the same time the evidence is provided to the DRB. The DRB will not consider evidence not furnished in conformance with the terms specified herein.
- G. The DRB shall furnish a report, containing findings and recommendations as described in the Dispute Review Board Agreement, in writing to both the State and the Contractor. The DRB shall complete its reports, including minority opinion, if any, and submit them to the parties within 30 days of the DRB hearing, except that time extensions may be granted at the request of the DRB with the written concurrence of both parties. The report shall include the facts and circumstances related to the matters under consideration, applicable laws and regulations, the pertinent provisions of the Contract and the actual costs and time incurred as shown on the Contractor's cost accounting records.
- H. Within 30 days after receiving the DRB's report, both the State and the Contractor shall respond to the DRB in writing signifying that the dispute is either resolved or remains unresolved. Failure to provide the written response within the time specified, or a written rejection of the DRB's recommendation presented in the report by either party, shall conclusively indicate that the party(s) failing to respond accepts the DRB recommendation. Immediately after responses have been received by both parties, the DRB will provide copies of both responses to the parties simultaneously. Either party may request clarification of elements of the DRB's report from the DRB prior to responding to the report. The DRB will consider any clarification request only if submitted within 10 days of receipt of the DRB's report, and if submitted simultaneously in writing to both the DRB and the other party. Each party may submit only one request for clarification for any individual DRB report. The DRB shall respond, in writing, to requests for clarification within 10 days of receipt of such requests.

- I. The DRB's recommendations, stated in the DRB's reports, are not binding on either party. Either party may seek a reconsideration of a recommendation of the DRB. The DRB shall only grant a reconsideration based upon submission of new evidence and if the request is submitted within the 30-day time limit specified for response to the DRB's written report. Each party may submit only one request for reconsideration regarding an individual DRB recommendation.
- J. If the State and the Contractor are able to resolve their dispute with the aid of the DRB's report, the State and Contractor shall promptly accept and implement the recommendations of the DRB.
- K. The State or the Contractor shall not call members who served on the DRB for this contract as witnesses in arbitration proceedings which may arise from this contract, and all documents created by the DRB shall be inadmissible as evidence in subsequent arbitration proceedings, except the DRB's final written reports on each issue brought before it.
- L. The State and Contractor shall jointly indemnify and hold harmless the DRB members from and against all claims, damages, losses, and expenses, including but not limited to attorney's fees, arising out of and resulting from the findings and recommendations of the DRB.
- M. The DRB members shall have no claim against the State or the Contractor, or both, from claimed harm arising out of the parties' evaluations of the DRB's report.

DISPUTES INVOLVING SUBCONTRACTOR CLAIMS

For purposes of this section, a "subcontractor claim" shall include any claim by a subcontractor (including also any pass through claims by a lower tier subcontractor or supplier) against the Contractor that is actionable by the Contractor against the Department which arises from the work, services, or materials provided or to be provided in connection with the contract. If the Contractor determines to pursue a dispute against the Department that includes a subcontractor claim, the dispute shall be processed and resolved in conformance with these special provisions and in conformance with the following:

- A. The Contractor shall identify clearly in submissions pursuant to this section, that portion of the dispute that involves a subcontractor claim or claims.
- B. The Contractor shall include, as part of its submission pursuant to Step 4 above, a certification (False Claims Act Certification) by the subcontractor's or supplier's officer, partner, or authorized representative with authority to bind the subcontractor and with direct knowledge of the facts underlying the subcontractor claim. The Contractor shall submit a certification that the subcontractor claim is acknowledged and forwarded by the Contractor. The form for these certifications are available from the Engineer.
- C. At any DRB meeting on a dispute that includes one or more subcontractor claims, the Contractor shall require that each subcontractor that is involved in the dispute have present an authorized representative with actual knowledge of the facts underlying the subcontractor claim to assist in presenting the subcontractor claim and to answer questions raised by the DRB members or the Department's representatives.
- D. Failure by the Contractor to declare a subcontractor claim on behalf of its subcontractor (including lower tier subcontractors' and suppliers' pass through claims) at the time of submission of the Contractor's claims, as provided hereunder, shall constitute a release of the Department by the Contractor on account of such subcontractor claim.
- E. The Contractor shall include in all subcontracts under this contract that subcontractors and suppliers of any tier (a) agree to submit subcontractor claims to the Contractor in a proper form and in sufficient time to allow processing by the Contractor in conformance with the Dispute Review Board resolution specifications; (b) agree to be bound by the terms of the Dispute Review Board provisions to the extent applicable to subcontractor claims; (c) agree that, to the extent a subcontractor claim is involved, completion of all steps required under these Dispute Review Board special provisions shall be a condition precedent to pursuit by the subcontractor of other remedies permitted by law, including without limitation of a lawsuit against the Contractor; and (d) agree that the existence of a dispute resolution process for disputes involving subcontractor claims shall not be deemed to create any claim, right, or cause of action by any subcontractor or supplier against the Department.

Notwithstanding the foregoing, this Dispute Review Board special provision shall not apply to, and the DRB shall not have the authority to consider, subcontractor claims between the subcontractor(s) or supplier(s) and the Contractor that is not actionable by the Contractor against the Department.

A copy of the "Dispute Review Board Agreement" to be executed by the Contractor, State and the 3 DRB members after approval of the contract follows:

DISPUTE REVIEW BOARD AGREEMENT

(Contract Identification)

Contract No. _____

THIS DISPUTE REVIEW BOARD AGREEMENT, hereinafter called "AGREEMENT", made and entered into this _____ day of _____, _____, between the State of California, acting through the California Department of Transportation and the Director of Transportation, hereinafter called the "STATE," _____ hereinafter called the "CONTRACTOR," and the Dispute Review Board, hereinafter called the "DRB" consisting of the following members:

_____,
(Contractor Appointee)

_____,
(State Appointee)

and _____
(Third Person)

WITNESSETH, that

WHEREAS, the STATE and the CONTRACTOR, hereinafter called the "parties," are now engaged in the construction on the State Highway project referenced above; and

WHEREAS, the special provisions for the above referenced contract provides for the establishment and operation of the DRB to assist in resolving disputes; and

WHEREAS, the DRB is composed of three members, one selected by the STATE, one selected by the CONTRACTOR, and the third member selected by the other two members and approved by the parties;

NOW THEREFORE, in consideration of the terms, conditions, covenants, and performance contained herein, or attached and incorporated and made a part hereof, the STATE, the CONTRACTOR, and the DRB members hereto agree as follows:

SECTION I DESCRIPTION OF WORK

To assist in the resolution of disputes between the parties, the contract provides for the establishment and the operation of the DRB. The intent of the DRB is to fairly and impartially consider disputes placed before it and provide written recommendations for resolution of these disputes to both parties. The members of this DRB shall perform the services necessary to participate in the DRB's actions as designated in Section II, Scope of Work.

SECTION II SCOPE OF WORK

The scope of work of the DRB includes, but is not limited to, the following:

A. OBJECTIVE

The principal objective of the DRB is to assist in the timely resolution of disputes between the parties arising from performance of this contract. It is not intended for either party to default on their normal responsibility to amicably and fairly settle their differences by indiscriminately assigning them to the DRB. It is intended that the mere existence of the DRB will encourage the parties to resolve disputes without resorting to this review procedure. But when a dispute which is serious enough to warrant the DRB's review does develop, the process for prompt and efficient action will be in place.

B. PROCEDURES

The DRB shall render written reports on disputes between the parties arising from the construction contract. Prior to consideration of a dispute, the DRB shall establish rules and regulations that will govern the conduct of its business and reporting procedures in conformance with the requirements of the contract and the terms of this AGREEMENT. DRB recommendations, resulting from its consideration of a dispute, shall be furnished in writing to both parties. The recommendations shall be based on the pertinent contract provisions, and the facts and circumstances involved in the dispute. The recommendations shall find one responsible party in a dispute; shared or "jury" determinations shall not be rendered.

The DRB shall refrain from officially giving advice or consulting services to anyone involved in the contract. The individual members shall act in a completely independent manner and while serving as members of the DRB shall have no consulting business connections with either party or its principals or attorneys or other affiliates (subcontractors, suppliers, etc.) who have a beneficial interest in the contract.

During scheduled meetings of the DRB as well as during dispute hearings, DRB members shall refrain from expressing opinions on the merits of statements on matters under dispute or potential dispute. Opinions of DRB members expressed in private sessions shall be kept strictly confidential. Individual DRB members shall not meet with, or discuss contract issues with individual parties, except as directed by the DRB Chairperson. Such discussions or meetings shall be disclosed to both parties. Other discussions regarding the project between the DRB members and the parties shall be in the presence of all three members and both parties. Individual DRB members shall not undertake independent investigations of any kind pertaining to disputes or potential disputes, except with the knowledge of both parties and as expressly directed by the DRB Chairperson.

C. CONSTRUCTION SITE VISITS, PROGRESS MEETINGS AND FIELD INSPECTIONS

The DRB members shall visit the project site and meet with representatives of the parties to keep abreast of construction activities and to develop familiarity with the work in progress. Scheduled progress meetings shall be held at or near the project site. The DRB shall meet at least once at the start of the project, and at least once every 6 months thereafter. The frequency, exact time, and duration of additional site visits and progress meetings shall be as recommended by the DRB and approved by the parties consistent with the construction activities or matters under consideration and dispute. Each meeting shall consist of a round table discussion and a field inspection of the work being performed on the contract, if necessary. Each meeting shall be attended by representatives of both parties. The agenda shall generally be as follows:

1. Meeting opened by the DRB Chairperson.
2. Remarks by the STATE's representative.
3. A description by the CONTRACTOR's representative of work accomplished since the last meeting; the current schedule status of the work; and a forecast for the coming period.
4. An outline by the CONTRACTOR's representative of potential problems and a description of proposed solutions.
5. An outline by the STATE's representative of the status of the work as the STATE views it.
6. A brief description by the CONTRACTOR's or STATE's representative of potential claims or disputes which have surfaced since the last meeting.
7. A summary by the STATE's representative, the CONTRACTOR's representative, or the DRB of the status of past disputes and claims.

The STATE's representative will prepare minutes of all regular meetings and circulate them for revision and approval by all concerned.

The field inspection shall cover all active segments of the work, the DRB being accompanied by both parties' representatives. The field inspection may be waived upon mutual agreement of the parties.

D. DRB CONSIDERATION AND HANDLING OF DISPUTES

Upon receipt by the DRB of a written referral of a dispute, the DRB shall convene to review and consider the dispute. The DRB shall determine the time and location of DRB hearings, with due consideration for the needs and preferences of the parties while recognizing the paramount importance of speedy resolution of issues. If the matter is not urgent, it may be scheduled for the time of the next scheduled DRB visit to the project. For an urgent matter, and upon the request of either party, the DRB shall meet at its earliest convenience.

Normally, hearings shall be conducted at or near the project site. However, any location which would be more convenient and still provide required facilities and access to necessary documentation shall be satisfactory.

Both parties shall be given the opportunity to present their evidence at these hearings. It is expressly understood that the DRB members are to act impartially and independently in the consideration of the contract provisions, and the facts and conditions surrounding any dispute presented by either party, and that the recommendations concerning any such dispute are advisory and nonbinding on the parties.

The DRB may request that written documentation and arguments from both parties be sent to each DRB member, through the DRB Chairperson, for review before the hearing begins. A party furnishing written documentation to the DRB shall furnish copies of such information to the other party at the same time that such information is supplied to the DRB.

DRB hearings shall be informal. There shall be no testimony under oath or cross-examination. There shall be no reporting of the procedures by a shorthand reporter or by electronic means. Documents and verbal statements shall be received by the DRB in conformance with acceptance standards established by the DRB. These standards need not comply with prescribed legal laws of evidence.

The third DRB member shall act as Chairperson for dispute hearings and all other DRB activities. The parties shall have a representative at all hearings. Failure to attend a duly noticed meeting by either of the parties shall be conclusively considered by the DRB as indication that the non-attending party considers written submittals as their entire and complete argument. The claimant shall discuss the dispute, followed by the other party. Each party shall then be allowed one or more rebuttals until all aspects of the dispute are thoroughly covered. DRB members may ask questions, seek clarification, or request further data from either of the parties. The DRB may request from either party documents or information that would assist the DRB in making its findings and recommendations including, but not limited to, documents used by the CONTRACTOR in preparing the bid for the project. A refusal by a party to provide information requested by the DRB may be considered by the DRB as an indication that the requested material would tend to disprove that party's position. Claims shall not necessarily be computed by merely subtracting bid price from the total cost of the affected work. However, if claims are based on the "total cost method," then, to be considered by the DRB, they shall be supported by evidence furnished by the CONTRACTOR that (1) the nature of the dispute(s) makes it impossible or impracticable to determine costs with a reasonable degree of accuracy, (2) the CONTRACTOR's bid estimate was realistic, (3) the CONTRACTOR's actual costs were reasonable, and (4) the CONTRACTOR was not responsible for the added expenses. As to claims based on the CONTRACTOR's field or home office accounting records, those claims shall be supported by an audit report of an independent Certified Public Accountant unless the contract includes special provisions that provide for an alternative method to calculate unabsorbed home office overhead. Any of those claims shall also be subject to audit by the DRB with the concurrence of the parties. In large or complex cases, additional hearings may be necessary in order to consider all the evidence presented by both parties. All involved parties shall maintain the confidentiality of all documents and information, as provided in this AGREEMENT.

During dispute hearings, no DRB member shall express an opinion concerning the merit of any facet of the case. DRB deliberations shall be conducted in private, with interim individual views kept strictly confidential.

After hearings are concluded, the DRB shall meet in private and reach a conclusion supported by 2 or more members. Private sessions of the DRB may be held at a location other than the job site or by electronic conferencing as deemed appropriate, in order to expedite the process.

The DRB's findings and recommendations, along with discussion of reasons therefor, shall then be submitted as a written report to both parties. Recommendations shall be based on the pertinent contract provisions, applicable laws and regulations, and facts and circumstances related to the dispute. The report shall be thorough in discussing the facts considered, the contract language, law or regulation viewed by the DRB as pertinent to the issues, and the DRB's interpretation and philosophy in arriving at its conclusions and recommendations. The DRB's report shall stand on its own, without attachments or appendices. The DRB chairman shall complete and furnish a summary report to the DRB Program Manager, Construction Program, MS 44, P.O. Box 942874, Sacramento, CA 94274.

With prior written approval of both parties, the DRB may obtain technical services necessary to adequately review the disputes presented, including audit, geotechnical, schedule analysis and other services. The parties' technical staff may supply those services as appropriate. The cost of technical services, as agreed to by the parties, shall be borne equally by the 2 parties as specified in an approved contract change order. The CONTRACTOR will not be entitled to markups for the payments made for these services.

The DRB shall resist submittal of incremental portions of information by either party, in the interest of making a fully-informed decision and recommendation.

The DRB shall make every effort to reach a unanimous decision. If this proves impossible, the dissenting member shall prepare a minority opinion, which shall be included in the DRB's report.

Although both parties should place weight upon the DRB's recommendations, they are not binding. Either party may appeal a recommendation to the DRB for reconsideration. However, reconsideration shall only be allowed when there is new evidence to present, and the DRB shall accept only one appeal from each party pertaining to an individual DRB recommendation. The DRB shall hear appeals in conformance with the terms described in the Section entitled "Dispute Review Board" in the special provisions.

E. DRB MEMBER REPLACEMENT

Should the need arise to appoint a replacement DRB member, the replacement DRB member shall be appointed in the same manner as the original DRB members were appointed. The selection of a replacement DRB member shall begin promptly upon notification of the necessity for a replacement and shall be completed within 14 days. This AGREEMENT will be amended to indicate change in DRB membership.

SECTION III CONTRACTOR RESPONSIBILITIES

The CONTRACTOR shall furnish to each DRB member one copy of pertinent documents which are or may become necessary for the DRB to perform their function. Pertinent documents are drawings or sketches, calculations, procedures, schedules, estimates, or other documents which are used in the performance of the work or in justifying or substantiating the CONTRACTOR's position. The CONTRACTOR shall also furnish a copy of such pertinent documents to the STATE, in conformance with the terms outlined in the special provisions.

SECTION IV STATE RESPONSIBILITIES

The STATE will furnish the following services and items:

A. CONTRACT RELATED DOCUMENTS

The STATE will furnish to each DRB member one copy of Notice to Contractors and Special Provisions, Proposal and Contract, Plans, Standard Specifications, and Standard Plans, change orders, written instructions issued by the STATE to the CONTRACTOR, or other documents pertinent to any dispute that has been referred to the DRB and necessary for the DRB to perform its function.

B. COORDINATION AND SERVICES

The STATE, through the Engineer, will, in cooperation with the CONTRACTOR, coordinate the operations of the DRB. The Engineer will arrange or provide conference facilities at or near the project site and provide secretarial and copying services to the DRB without charge to the CONTRACTOR.

SECTION V TIME FOR BEGINNING AND COMPLETION

Once established, the DRB shall be in operation until the day of acceptance of the contract. The DRB members shall not begin work under the terms of this AGREEMENT until authorized in writing by the STATE.

SECTION VI PAYMENT

A. ALL INCLUSIVE RATE PAYMENT

The STATE and the CONTRACTOR shall bear the costs and expenses of the DRB equally. Each DRB board member shall be compensated at an agreed rate of \$1,000 per day if time spent per meeting, including on-site time plus one hour of travel time, is greater than 4 hours. Each DRB board member shall be compensated at an agreed rate of \$600 per day if time spent per meeting, including on-site time plus one hour of travel time, is less than or equal to 4 hours. The agreed rates shall be considered full compensation for on-site time, travel expenses, transportation, lodging, time for travel and incidentals for each day, or portion thereof, that the DRB member is at an authorized DRB meeting. No additional compensation will be made for time spent by DRB members in review and research activities outside the official DRB meetings unless that time has been specifically agreed to in advance by the STATE and CONTRACTOR. Time away from the project, that has been specifically agreed to in advance by the parties, will be compensated at an agreed rate of \$100 per hour. The agreed amount of \$100 per hour shall include all incidentals including expenses for telephone, fax, and computer services. Members serving on more than one DRB, regardless of the number of meetings per day, shall not be paid more than the all inclusive rate per day or rate per hour for an individual project. The STATE will provide, at no cost to the CONTRACTOR, administrative services such as conference facilities and secretarial services to the DRB.

B. PAYMENTS

DRB members shall be compensated at the same rate. The CONTRACTOR shall make direct payments to each DRB member for their participation in authorized meetings and approved hourly rate charges from invoices submitted by each DRB member. The STATE will reimburse the CONTRACTOR for its share of the costs of the DRB.

The DRB members may submit invoices to the CONTRACTOR for partial payment for work performed and services rendered for their participation in authorized meetings not more often than once per month during the progress of the work. The invoices shall be in a format approved by the parties and accompanied by a general description of activities performed during that billing period. Payment for hourly fees, at the agreed rate, shall not be paid to a DRB member until the amount and extent of those fees are approved by the STATE and CONTRACTOR.

Invoices shall be accompanied by original supporting documents, which the CONTRACTOR shall include with the extra work billing when submitting for reimbursement of the STATE's share of cost from the STATE. The CONTRACTOR will be reimbursed for one-half of approved costs of the DRB. No markups will be added to the CONTRACTOR's payment.

C. INSPECTION OF COSTS RECORDS

The DRB members and the CONTRACTOR shall keep available for inspection by representatives of the STATE and the United States, for a period of 3 years after final payment, the cost records and accounts pertaining to this AGREEMENT. If any litigation, claim, or audit arising out of, in connection with, or related to this contract is initiated before the expiration of the 3-year period, the cost records and accounts shall be retained until such litigation, claim, or audit involving the records is completed.

SECTION VII ASSIGNMENT OF TASKS OF WORK

The DRB members shall not assign the work of this AGREEMENT.

SECTION VIII TERMINATION OF AGREEMENT, THE DRB, AND DRB MEMBERS

DRB members may resign from the DRB by providing not less than 14 days written notice of the resignation to the STATE and CONTRACTOR. DRB members may be terminated by their original appointing power, in conformance with the terms of the contract.

SECTION IX LEGAL RELATIONS

The parties hereto mutually understand and agree that the DRB member in the performance of duties on the DRB, is acting in the capacity of an independent agent and not as an employee of either party.

No party to this AGREEMENT shall bear a greater responsibility for damages or personal injury than is normally provided by Federal or State of California Law.

Notwithstanding the provisions of this contract that require the CONTRACTOR to indemnify and hold harmless the STATE, the parties shall jointly indemnify and hold harmless the DRB members from and against all claims, damages, losses, and expenses, including but not limited to attorney's fees, arising out of and resulting from the findings and recommendations of the DRB.

SECTION X CONFIDENTIALITY

The parties hereto mutually understand and agree that all documents and records provided by the parties in reference to issues brought before the DRB, which documents and records are marked "Confidential - for use by the DRB only," shall be kept in confidence and used only for the purpose of resolution of subject disputes, and for assisting in development of DRB findings and recommendations; that such documents and records will not be utilized or revealed to others, except to officials of the parties who are authorized to act on the subject disputes, for any purposes, during the life of the DRB. Upon termination of this AGREEMENT, said confidential documents and records, and all copies thereof, shall be returned to the parties who furnished them to the DRB. However, the parties understand that such documents shall be subsequently discoverable and admissible in court or arbitration proceedings unless a protective order has been obtained by the party seeking further confidentiality.

SECTION XI DISPUTES

Disputes between the parties hereto, including disputes between the DRB members and either party or both parties, arising out of the work or other terms of this AGREEMENT, which cannot be resolved by negotiation and mutual concurrence between the parties, or through the administrative process provided in the contract, shall be resolved by arbitration as provided in Section 9-1.10, "Arbitration," of the Standard Specifications.

SECTION XII VENUE, APPLICABLE LAW, AND PERSONAL JURISDICTION

In the event that any party, including an individual member of the DRB, deems it necessary to institute arbitration proceedings to enforce any right or obligation under this AGREEMENT, the parties hereto agree that such action shall be initiated in the Office of Administrative Hearings of the State of California. The parties hereto agree that all questions shall be resolved by arbitration by application of California law and that the parties to such arbitration shall have the right of appeal from such decisions to the Superior Court in conformance with the laws of the State of California. Venue for the arbitration shall be Sacramento or any other location as agreed to by the parties.

SECTION XIII FEDERAL REVIEW AND REQUIREMENTS

On Federal-Aid contracts, the Federal Highway Administration shall have the right to review the work of the DRB in progress, except for private meetings or deliberations of the DRB.

Other Federal requirements in this agreement shall only apply to Federal-Aid contracts.

SECTION XIV CERTIFICATION OF THE CONTRACTOR, THE DRB MEMBERS, AND THE STATE

IN WITNESS WHEREOF, the parties hereto have executed this AGREEMENT as of the day and year first above written.

DRB MEMBER

By: _____

Title: _____

DRB MEMBER

By: _____

Title : _____

DRB MEMBER

By : _____

Title : _____

CONTRACTOR

By: _____

Title: _____

CALIFORNIA STATE DEPARTMENT
OF TRANSPORTATION

By: _____

Title: _____

5-1.21 AREAS FOR CONTRACTOR'S USE

Attention is directed to the provisions in Section 7-1.19, "Rights in Land and Improvements," of the Standard Specifications and these special provisions.

The highway right of way shall be used only for purposes that are necessary to perform the required work. The Contractor shall not occupy the right of way, or allow others to occupy the right of way, for purposes which are not necessary to perform the required work.

No State-owned parcels adjacent to the right of way are available for the exclusive use of the Contractor within the contract limits. The Contractor shall secure, at the Contractor's own expense, areas required for plant sites, storage of equipment or materials, or for other purposes.

No area is available within the contract limits for the exclusive use of the Contractor. However, temporary storage of equipment and materials on State property may be arranged with the Engineer, subject to the prior demands of State maintenance forces and to other contract requirements. Use of the Contractor's work areas and other State-owned property shall be at the Contractor's own risk, and the State shall not be held liable for damage to or loss of materials or equipment located within such areas.

5-1.22 UTILITIES

The Contractor shall make arrangements to obtain any additional electrical power, water, or compressed air or other utilities required for the Contractor's operations and shall make and maintain the necessary service connections at the Contractor's own expense.

5-1.23 SANITARY PROVISIONS

State sanitary facilities will not be available for use by the Contractor's employees.

5-1.24 ACCESS TO JOBSITE

Prospective bidders may make arrangements to visit the jobsite by contacting the Toll Bridge Duty Senior, 111 Grand Avenue, Oakland, California 94612, telephone (510) 286-5549 or e-mail at duty_senior_tollbridge_district04@dot.ca.gov.

5-1.25 DRAWINGS

Attention is directed to Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications and these special provisions.

When working drawings are required by these special provisions, the drawings shall be submitted in conformance with the provisions in Section 55-1.02, "Drawings," of the Standard Specifications and the following:

- A. Working drawings shall be submitted to the Engineer.
- B. Working drawings shall not exceed 559 mm x 864 mm in size.
- C. Microfilms are required of approved shop drawings and shall be only a 24x reduction.

Working drawings will be required for but not limited to:

- Reinforced recycled plastic lumber
- Prestressing(strand and bar systems)
- PTFE spherical bearings
- Permanent steel casing for 2.5m CIDH's
- Structural steel
- Miscellaneous metal
- Hinge C and D bearings
- Hinge Construction(Hinges A and B)

Hinge Construction(Hinges C and D)
 Hinge Construction (Hinge E)
 Movable Inspection Platforms
 Prestressed concrete footing forms
 Access trestles
 Elastomeric bumpers
 Fiberglass doors and grating
 Health Monitoring System(Shipping Channel Span)
 Joint seal assemblies
 Attaching lifting systems to the superstructure for hinge assembly
 Temporary supports for bar reinforcing assemblages
 Permanent steel casing handling plan
 Welding QCP's, WPS's, FCP's
 Cofferdams
 Falsework
 Segmental erection sequence and construction loadsContractor's geometry control technician experience
 In-place Friction TestsContractor Engineer's Experience
 Form traveler design
 Design Calculations(Super and Sub-Structure)
 Form Traveler Operation Manual
 Geometry Control Plan and Manual
 Checkpoints
 Camber calculations and casting curves
 Closure work plan and locking device
 Rhodia Outfall protection plan
 Pier 5 construction plan
 Pier 5 backfill materials
 Pile installation template
 Pile repair mitigation plan
 Prestressing system qualifications
 Thermal control and temperature monitoring plans for mass concrete
 Lightweight concrete quality control plan
 Temporary counterweights and pier table struts
 Tower cranes (if used)
 Superstructure jacking (if used)
 Temporary hinge tiedowns
 Test blocks

The Contractor shall submit 3 copies of manufacturer's catalog sheets and maintenance and operation booklets or instructions to the Engineer.

5-1.26 PERMITS AND LICENSES

Attention is directed to Section 7-1.04, "Permits and Licenses," of the Standard Specifications and these special provisions.

The Department has obtained the following permits for this project:

- A. USCG Bridge permit-New Benicia bridge
- A. BCDC permit No. 17-99 (M)
- D. National Marine Fisheries Service
- B. RWCQB File No. 2128.03
- F. U.S. Army Corps of Engineer-File No.....
- G. U.S. Fish and Wildlife Service-file No.1-1-96-F-40

Copies of these permits can be obtained at the Department of Transportation, Plans and Bid Documents Section, (MS 26), 1120 N Street, Room 200, Sacramento, CA 95814, Telephone (916) 654-4490 or may be seen at the office of the Toll Bridge Program Duty Senior's Desk, 111 Grand Avenue, Oakland, California 94612-3717. Please call the Toll Bridge Program Duty Senior, Telephone No. (510) 286-5549 or e-mail at duty_senior_tollbridge_district04@dot.ca.gov, to reserve copies at least 24 hours in advance.

Full compensation for conforming to the requirements in these permits shall be considered as included in the contract prices paid for the various items of work and no additional compensation will be allowed therefor.

5-1.27 SUNKEN DEBRIS REMOVAL

Should the Contractor during the progress of the work, sink, lose, or throw overboard any material, plant or machinery into the waters of the Bay, he shall recover or remove such debris within 10 days.

The Contractor shall give immediate notice to proper authorities and shall mark the location of the fallen debris with U.S. Coast Guard-approved lighted buoys until such debris are removed. Attention is directed to Section "Relations with the U.S. Coast Guard" of these special provisions regarding specific conditions in connection with obstructions to navigation

5-1.28 ASBESTOS-CONTAINING MATERIAL

Asbestos-containing material, as defined in Section 1529, "Asbestos," of the Construction Safety Orders, Title 8, of the California Code of Regulations, is present within the project limits. The 254 mm Contra Costa Water District raw Waterline to be removed, as specified on the plans, is asbestos-containing material.

Attention is directed to Section 7-1.06, "Safety and Health Provisions," of the Standard Specifications. Work practices and worker health and safety during any work that results in disturbance of asbestos-containing material shall conform to Section 1529, "Asbestos," of the Construction Safety Orders, Title 8, of the California Code of Regulations. The Contractor shall obtain all certifications and registrations required to do the work and certify in writing to the Engineer that the personnel performing the work have completed a training program appropriate for the work involved. Written notification of exposure monitoring results shall be submitted to the Engineer upon completion of the monitoring. A copy of any required written certification of the adequacy of alternative work practices shall be submitted to the Engineer before performing any work.

The requirements of subsection (d), "Multi-employer worksites," of Section 1529, "Asbestos," of the Construction Safety Orders, Title 8, of the California Code of Regulations shall be observed during performance of the work. This shall not be construed as relieving the Contractor from the Contractor's responsibilities as provided in Section 8-1.01, "Subcontracting," of the Standard Specifications.

Any friable asbestos-containing material or non-friable asbestos-containing material damaged during the work, so that it becomes friable or is in a finely divided or powdered state, shall be wetted and sealed in leak-tight, non-returnable containers, such as 2 bags of 0.15 mm plastic, cartons, drums, or cans. Bulk friable asbestos-containing material that will not fit into containers without additional breaking shall be double-wrapped, sealed, and wetted. Trailers, drop-boxes, or other vehicles used for transport of bulk materials shall be lined with plastic sheeting and covered with a tarp. Each container and wrapped material shall be properly labeled, manifested and transported to a facility permitted to accept such material. The Engineer will obtain the United States Environmental Protection Agency Identification Number and sign all manifests as the Generator.

Any other material that has been in contact with friable, finely divided, or powdered asbestos-containing material shall be cleaned thoroughly before removal from the work area. If the Contractor chooses not to clean the material, it shall be handled in accordance with the provisions for bulk friable asbestos-containing material.

Full compensation for conforming to the requirements of this section shall be considered as included in the contract prices paid for the various items of work involved, and no additional compensation will be allowed therefor.

5-1.29 PARTNERING

The State will promote the formation of a "Partnering" relationship with the Contractor in order to effectively complete the contract to the benefit of both parties. The purpose of this relationship will be to maintain cooperative communication and mutually resolve conflicts at the lowest possible management level.

A one-day "Training in Partnering Concepts" forum will be conducted regardless of whether the Contractor requests the formation of a "Partnering" relationship. The forum will be conducted locally for the Contractor and the Engineer's project representatives. The Contractor shall be represented by a minimum of two representatives, one being the Contractor's authorized representative pursuant to Section 5-1.06, "Superintendence," of the Standard Specifications. If, upon the Contractor's request, "Partnering" is approved by the Engineer, "Training in Partnering Concepts" shall be conducted prior to the "Partnering" workshop. Scheduling of "Training in Partnering Concepts," selection of the Engineer's representatives to participate in "Training of Partnering Concepts," and selection of the partnering concepts trainer and site shall be as determined by the Engineer.

The Contractor may request the formation of a "Partnering" relationship by submitting a request in writing to the Engineer after approval of the contract. If the Contractor's request for "Partnering" is approved by the Engineer, scheduling

of a "Partnering" workshop, selecting the "Partnering" facilitator and workshop site, and other administrative details shall be agreed to by both parties.

The costs involved in providing a trainer and site for the "Training in Partnering Concepts" forum will be borne by the State. The Contractor shall pay all compensation for the wages and expenses of the facilitator and of the expenses for obtaining the workshop site. The State will reimburse the Contractor for these costs as extra work in conformance with the provisions in Section 4-1.03D of the Standard Specifications. Full compensation for the wages and expenses of the Contractor's representatives, including travel costs, shall be considered as included in the contract prices paid for the various items of work and no additional compensation will be allowed therefor.

The costs involved in providing a "Partnering" facilitator and a workshop site will be borne equally by the State and the Contractor. The Contractor shall pay all compensation for the wages and expenses of the facilitator and of the expenses for obtaining the workshop site. The State's share of such costs will be reimbursed to the Contractor in a change order written by the Engineer.

Markups will not be added to the costs of "Training in Partnering Concepts" or the costs of providing a "Partnering" facilitator and workshop site. All other costs associated with the "Partnering" relationship will be borne separately by the party incurring the costs.

The establishment of a "Partnering" relationship will not change or modify the terms and conditions of the contract and will not relieve either party of the legal requirements of the contract.

5-1.30 PHOTOGRAPHY

The Contractor shall provide time-lapse video and still photography to document pre-construction conditions, and progress and completion of the work, as directed by the Engineer. Photography will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications, and will not be considered a special service as specified in Section 9-1.03B of the Standard Specifications.

5-1.31 TIDAL CONDITIONS AND ELEVATION DATUM

Attention is directed to Section 2-1.03, "Examination of Plans, Specifications, Contract, and Site of Work."

Tidal conditions may present significant problems in constructing the work as depicted in the contract plans. Tidal fluctuations may be severe and different from those shown in published tidal and current data due to differences in datum, winter runoff and other causes. Strong currents exist over portions of the project site. Limited time periods of slack water may restrict diving and other underwater activities.

The Contractor is responsible for being knowledgeable of such tidal difficulties, and no payment will be made by the State for any costs incurred by the Contractor in connection with the variations in actual tidal or current conditions during the course of this contract. Any reference to Mean Higher High and Mean Lower Low tides shall be understood to be an estimate used for permit purposes, actual mean tide data shall be determined by the Contractor.

All vertical control data are based on the National Geodetic Vertical Datum (NGVD) of 1929.

5-1.32 COST REDUCTION INCENTIVE

Attention is directed to Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications.

Prior to preparing a cost reduction proposal, the Contractor shall request a meeting with the Engineer to discuss the proposal in concept and to determine the merit of the cost reduction proposal. Items of discussion will also include permit issues, impact on other projects, impact on the project schedule, peer reviews, and review times required by the Department and other agencies.

The Contractor's attention is also directed to Sections 10-1.45, "Cost Reduction Incentive Proposals For Cast-In-Place Prestressed Box Girder Bridges Constructed On Falsework" and "Cost Reduction Incentive Proposals For Cast-In-Place Segmentally Constructed Prestressed Box Girder bridges" of these special provisions

5-1.33 SOUND CONTROL REQUIREMENTS

Sound control shall conform to the provisions in Section 7-1.01I, "Sound Control Requirements," of the Standard Specifications and these special provisions.

The noise level from all of the Contractor's operations, between the hours of 9:00 p.m. and 7:00 a.m., shall not exceed 86 dbA at a distance of 15 meters. No pile driving operation, except when using vibratory hammers only, will be allowed between the hours of 9:00 p.m. and 7:00 a.m. This requirement in no way relieves the Contractor from said responsibility for complying with local ordinances regulating noise level.

Said noise level requirement shall apply to all equipment on the job or related to the job, including but not limited to trucks, transit mixers or transient equipment that may or may not be owned by the Contractor. The use of loud sound signals shall be avoided in favor of light warnings except those required by safety laws for the protection of personnel.

Full compensation for conforming to the requirements of this section shall be considered as included in the prices paid for the various contract items of work involved and no additional compensation will be allowed therefor.

5-1.34 ENVIRONMENTAL WORK RESTRICTIONS

"The Contractor's attention is directed to the existence of environmental restrictions that require special precautions be taken by the Contractor to protect the species listed below. It is the Contractor's responsibility to keep informed of all State and Federal Laws.

The Contractor shall comply with the California Endangered Species Act and the Federal Act.

SPECIES OF CONCERN

Winter-run Chinook Salmon, Delta Smelt, Steelhead Trout, Spring-run Chinook Salmon, Coho Salmon, Sacramento Split tail, Harvest Mouse

All work in the waters of the Carquinez Strait less than 3 meters deep, as measured from the mean lower low water line, shall be limited to the period of July 1 through October 31. Work in a water surrounded area (where the water depth is less than 3m) that is fully contained within an earlier constructed cofferdam and is accessed via the Contractor's access trestle may be done during the restricted time period provided there is no disturbance whatsoever to the area outside the cofferdam.

5-1.35 USE OF DREDGED MATERIALS

If sand, gravel, aggregates, imported borrow or other minerals to be used on the project are dredged from San Francisco Bay, the Contractor shall provide documentation that a permit from the Bay Conservation and Development Commission (BCDC) has been obtained. The documentation shall include the permit number, parcel number and specific location of the source of the material. The Contractor must also include this information on the CEM3101 "Notice of Materials to be Used".

5-1.36 CONTAMINATED AND HAZARDOUS MATERIAL, GENERAL

Attention is directed to "Earthwork" of these special provisions regarding the removal and disposal of contaminated and hazardous material described in this section.

Contaminants have been discovered through testing within the project limits. Testing consisted of collecting and analyzing in situ samples from within the limits of excavation shown on the plans. A description of the sampling plan and summary tables of the test results are included in the "Materials Information." The complete reports entitled "Site Investigation Report: Benicia-Martinez Bridge Upland Areas" and "Sediment Sampling and Analysis Report: New Benicia-Martinez Bridge Project" are available for inspection at the Department of Transportation, Toll Bridge Duty Senior's Desk, 111 Grand Avenue, Oakland, California, (510) 286-5549, e-mail: duty_senior_tollbridge_district04@dot.ca.gov. Requests to review the reports must be made with the duty senior at least 24 hours in advance. These test results have been used for disposal characterization of material within the excavation limits and shall not be construed as identifying all locations within the project limits that contain contaminants. A summary table of results follows:

ABUTMENT 1						
SAMPLE DEPTH	SAMPLE ID	CAM 17	WET	TCLP	TPH-G	TPH-D
bgs		mg/kg	mg/L	mg/L	mg/kg	mg/kg
0.3 m	A1-0.3	Pb 38	---	---	<1.0	<5.0
	A2-0.3	Pb 233	24	0.46	<1.0	<2.0
	A3-0.3	Pb 64	0.86	---	<1.0	23*
	A4-0.3	Pb 15	---	---	<1.0	< 10
	A5-0.3	Pb 63	6.1	0.46	<1.0	<1.0
0.9 m	A1-0.9	Pb 1.9	---	---	<1.0	<1.0
	A2-0.9	Pb 8.3	---	---	<1.0	<1.0
	A3-0.9	Pb 6.2	---	---	<1.0	< 10
	A4-0.9	Pb 73	4.5	---	<1.0	19*
	A5-0.9	Pb 9.8	---	---	<1.0	<1.0
1.5 m	A1-1.5	Pb 4	---	---	<1.0	<1.0
	A2-1.5	Pb 6.7	---	---	<1.0	<1.0
	A3-1.5	Pb 16	---	---	<1.0	< 10
	A4-1.5	Pb 31	---	---	<1.0	< 10
	A5-1.5	Pb 9.2	---	---	<1.0	<1.0
3 m	A1-3	Pb 1.5	---	---	<1.0	<1.0
	A2-3	Pb 9	---	---	<1.0	<1.0
	A5-3	Pb 6.1	---	---	<1.0	<1.0
4.5 m	A1-4.5	Pb 3.6	---	---	<1.0	<1.0
	A2-4.5	Pb 1.4	---	---	<1.0	<1.0
	A5-4.5	Pb 1.4	---	---	<1.0	<1.0

ABUTMENT 1						
SAMPLE DEPTH	SAMPLE ID	TPH-MO	VOCs	SVOCs	PESTI-CIDES	PCBs
bgs		mg/kg	g/kg	g/kg	g/kg	g/kg
0.3 m	A1-0.3	<5.0	Toluene = 5.2	ND	ND	Aroclor-1254 = 46
			Xylenes = 8.8			
	A2-0.3	< 2.0	ND	ND	ND	Aroclor-1260 = 133
	A3-0.3	32**	ND	ND	ND	ND
	A4-0.3	< 10	ND	ND	ND	ND
	A5-0.3	614	ND	ND	ND	ND
0.9 m	A1-0.9	<1.0	ND	---	---	---
	A2-0.9	<1.0	ND	---	---	---
	A3-0.9	< 10	Toluene = 16	---	---	---
	A4-0.9	28**	ND	---	---	---
	A5-0.9	<1.0	ND	---	---	---
1.5 m	A1-1.5	<1.0	ND	ND	ND	ND
	A2-1.5	<1.0	ND	ND	ND	ND
	A3-1.5	< 10	Toluene = 14	ND	ND	ND
	A4-1.5	< 10	ND	ND	ND	ND
	A5-1.5	382	ND	ND	ND	ND
3 m	A1-3	<1.0	ND	---	---	---
	A2-3	<1.0	ND	---	---	---
	A5-3	<1.0	ND	---	---	---
4.5 m	A1-4.5	4.7 ***	ND	---	---	---
	A2-4.5	<1.0	ND	---	---	---
	A5-4.5	<1.0	ND	---	---	---

PIER 2						
SAMPLE DEPTH	SAMPLE ID	CAM 17	WET	TCLP	TPH-G	TPH-D
bgs		mg/kg	mg/L	mg/L	mg/kg	mg/kg
0.3 m	P2A-0.3	Pb 12	---	---	< 1.0	< 2.0
	P2B-0.3	Pb 87	3.3	---	< 1.0	< 1.0
1.5 m	P2A-1.5	Pb 21	---	---	< 1.0	< 1.0
	P2B-1.5	Pb 18	---	---	< 1.0	< 1.0
3.0 m	P2A-3.0	Pb 2.4	---	---	< 1.0	< 1.0
	P2B-3.0	Pb 16	---	---	< 1.0	< 1.0
4.5 m	P2A-4.5	Pb 20	---	---	< 1.0	< 1.0

PIER 2						
SAMPLE DEPTH	SAMPLE ID	TPH-MO	VOCs	SVOCs	PESTI-CIDES	PCBs
bgs		mg/kg	g/kg	g/kg	g/kg	g/kg
0.3 m	P2A-0.3	148	ND	ND	ND	ND
	P2B-0.3	< 1.0	ND	ND	ND	Aroclor-1254 = 139
1.5 m	P2A-1.5	< 1.0	ND	ND	ND	ND
	P2B-1.5	< 1.0	ND	ND	ND	ND
3.0 m	P2A-3.0	< 1.0	ND	---	---	---
	P2B-3.0	< 1.0	ND	---	---	---
4.5 m	P2A-4.5	< 1.0	ND	---	---	---

PIER 3						
SAMPLE DEPTH	SAMPLE ID	CAM 17	WET	TCLP	TPH-G	TPH-D
bgs		mg/kg	mg/L	mg/L	mg/kg	mg/kg
0.3 m	P3A-0.3	Pb 20	---	---	< 1.0	< 1.0
	P3B-0.3	Pb 31	---	---	< 1.0	< 1.0
1.5 m	P3A-1.5	Pb 14	---	---	< 1.0	< 1.0
	P3B-1.5	Pb 31	---	---	< 1.0	< 1.0
3.0 m	P3A-3.0	Pb 12	---	---	< 1.0	< 1.0
	P3B-3.0	Pb 35	---	---	< 1.0	< 1.0
4.5 m	P3A-4.5	Pb 9.4	---	---	< 1.0	< 1.0

PIER 3						
SAMPLE DEPTH	SAMPLE ID	TPH-MO	VOCs	SVOCs	PESTI-CIDES	PCBs
bgs		mg/kg	g/kg	g/kg	g/kg	g/kg
0.3 m	P3A-0.3	< 1.0	ND	ND	ND	ND
	P3B-0.3	< 1.0	ND	ND	ND	Aroclor-1254 =1170
1.5 m	P3A-1.5	< 1.0	ND	ND	ND	ND
	P3B-1.5	< 1.0	ND	ND	ND	ND
3.0 m	P3A-3.0	< 1.0	ND	---	---	---
	P3B-3.0	< 1.0	ND	---	---	---
4.5 m	P3A-4.5	< 1.0	ND	---	---	---

PIER 4						
SAMPLE DEPTH	SAMPLE ID	CAM 17	WET	TCLP	TPH-G	TPH-D
bgs		mg/kg	mg/L	mg/L	mg/kg	mg/kg
0.3 m	P4-0.3	Pb 40	---	---	< 1.0	< 1.0
		Cu 519	5.8	---		
1.5 m	P4-1.5	Pb 4.2	---	---	< 1.0	< 1.0
4.5 m	P4-3.0	Pb 10	---	---	< 1.0	< 1.0
4.5 m	P4-4.5	Pb 13	---	---	< 1.0	< 1.0

PIER 4						
SAMPLE DEPTH	SAMPLE ID	TPH-MO	VOCs	SVOCs	PESTI-CIDES	PCBs
bgs		mg/kg	g/kg	g/kg	g/kg	g/kg
0.3 m	P4-0.3	< 1.0	ND	ND	ND	ND
1.5 m	P4-1.5	< 1.0	ND	ND	ND	ND
4.5 m	P4-3.0	< 1.0	ND	---	---	---
4.5 m	P4-4.5	< 1.0	ND	---	---	---

PIER 5						
SAMPLE DEPTH	SAMPLE ID	CAM 17	WET	TCLP	TPH-G	TPH-D
bgs		mg/kg	mg/L	mg/L	mg/kg	mg/kg
0.3 m	P5-1-0.3	Pb 58	ND	---	---	---
		Cu 320	9.1	---		
	P5-3-0.3	Cu 1.7	0.1	---	---	---
		Pb 3.5	ND	---		
	P5-4-0.3	Pb 4.3	0.12	---	---	---
		Cu 6.3	0.2	---		
	P5-5-0.3	Pb 32	ND	---	---	---
		Cu 465	1.2	---		
0.9 m	P5-3-0.9	Pb 3.9	ND	---	---	---
		Cu 661	0.27	---		
	P5-4-0.9	Pb 8.4	0.19	---	---	---
		Cu 4.8	0.15	---		
1.5 m	P5-2-1.5	Pb 4.2	0.1	---	---	---
		Cu 19	1.2	---		
	P5-6-5	Pb 1.6	ND	---	---	---
		Cu 170	ND	---		
	P5-7-5	Pb ND	ND	---	---	---
		Cu 32	ND	---		
2.7 m	P5-1-2.7	Pb 7	ND	---	---	---
		Cu 933	2.9	---		
3.0 m	P5-6-10	Pb 1.2	ND	---	---	---
		Cu 229	ND	---		
	P5-7-10	Pb ND	ND	---	---	---
		Cu 32	ND	---		
4.6 m	P5-6-15	Pb 4.3	ND	---	---	---
		Cu 6460	206	---		
	P5-7-15	Pb 1.9	ND	---	---	---
		Cu 1120	1.6	---		
5.5 m	P5-7-18	Pb 14	ND	---	---	---
		Cu 10400	195	---		
7.8 m	P5-7.8	Pb 12	---	---	---	---
		Cu 286	0.52			
9.0 m	P5-9	Pb 7.4	---	---	---	---
		Cu 201	---	---		

PIER 5						
SAMPLE DEPTH	SAMPLE ID	TPH-MO	VOCs	SVOCs	PESTI-CIDES	PCBs
bgs		mg/kg	g/kg	g/kg	g/kg	g/kg
0.3 m	P5-1-0.3	---	---	---	---	---
	P5-3-0.3	---	---	---	---	---
	P5-4-0.3	---	---	---	---	---
	P5-5-0.3	---	---	---	---	---
0.9 m	P5-3-0.9	---	---	---	---	---
	P5-4-0.9	---	---	---	---	---
1.5 m	P5-2-1.5	---	---	---	---	---
	P5-6-5	---	---	---	---	---
	P5-7-5	---	---	---	---	---
2.7 m	P5-1-2.7	---	---	---	---	---
3.0 m	P5-6-10	---	---	---	---	---
	P5-7-10	---	---	---	---	---
4.6 m	P5-6-15	---	---	---	---	---
	P5-7-15	---	---	---	---	---
5.5 m	P5-7-18	---	---	---	---	---
7.8 m	P5-7.8	---	---	---	---	---
9.0 m	P5-9	---	---	---	---	---

AREA A EXCAVATION						
SAMPLE DEPTH	SAMPLE ID	CAM 17	WET	TCLP	TPH-G	TPH-D
bgs		mg/kg	mg/L	mg/L	mg/kg	mg/kg
0.3 m	B8-0.3	Pb 200	11	#	< 1.0	< 1.0
	B9-0.3	Pb 244	4.5	---	< 1.0	104*
1.5 m	B8-1.5	Pb 28	---	---	< 1.0	< 1.0
	B9-1.5	Pb 11	---	---	< 1.0	< 1.0
3.0 m	B8-3.0	Pb 12	---	---	< 1.0	< 1.0
	B9-3.0	Pb 4.5	---	---	< 1.0	< 1.0

AREA A EXCAVATION						
SAMPLE DEPTH	SAMPLE ID	TPH-MO	VOCs	SVOCs	PESTI-CIDES	PCBs
bgs		mg/kg	g/kg	g/kg	g/kg	g/kg
0.3 m	B8-0.3	< 1.0	ND	ND	ND	Aroclor-1254 = 660
	B9-0.3	35	ND	ND	ND	Aroclor-1254 = 223
1.5 m	B8-1.5	< 1.0	ND	ND	ND	ND
	B9-1.5	< 1.0	ND	ND	ND	ND
3.0 m	B8-3.0	< 1.0	ND	---	---	---
	B9-3.0	< 1.0	ND	---	---	---

AREA B EXCAVATION						
SAMPLE DEPTH	SAMPLE ID	CAM 17	WET	TCLP	TPH-G	TPH-D
bgs		mg/kg	mg/L	mg/L	mg/kg	mg/kg
0.3 m	B1-0.3	Pb 82	0.97	---	< 1.0	< 1.0
	B2-0.3	Pb 14	---	---	< 1.0	< 1.0
	B3-0.3	Pb 11	---	---	< 1.0	< 1.0
	B4-0.3	Pb 73	0.67	---	< 1.0	< 1.0
	B5-0.3	Pb 66	0.80	---	< 1.0	< 1.0
	B6-0.3	Pb 42	---	---	< 1.0	< 1.0
	B7-0.3	Pb 205	4.6	---	< 1.0	< 1.0
		Cu 353	7.6	---		
1.5 m	B1-1.5	Pb 27	---	---	< 1.0	< 1.0
	B2-1.5	Pb 25	---	---	< 1.0	< 1.0
	B3-1.5	Pb 4.8	---	---	< 1.0	< 1.0
	B4-1.5	Pb 23	---	---	< 1.0	< 1.0
	B5-1.5	Pb 64	0.60	---	< 1.0	< 1.0
		Se 15	0.12	---		
	B6-1.5	Pb 13	---	---	< 1.0	< 1.0
3.0 m	B1-3.0	Pb 22	---	---	< 1.0	< 1.0
	B2-3.0	Pb 11	---	---	< 1.0	< 1.0
	B3-3.0	Pb 6.8	---	---	< 1.0	< 1.0
	B4-3.0	Pb 14	---	---	< 1.0	< 1.0
	B6-3.0	Pb 14	---	---	< 1.0	< 1.0
4.5 m	B1-4.5	Pb 20	---	---	< 1.0	< 1.0

AREA B EXCAVATION						
SAMPLE DEPTH	SAMPLE ID	TPH-MO	VOCs	SVOCs	PESTI-CIDES	PCBs
bgs		mg/kg	g/kg	g/kg	g/kg	g/kg
0.3 m	B1-0.3	< 1.0	ND	ND	ND	ND
	B2-0.3	< 1.0	ND	ND	ND	ND
	B3-0.3	< 1.0	ND	ND	ND	ND
	B4-0.3	< 1.0	Xylenes = 9.0	ND	ND	ND
	B5-0.3	< 1.0	ND	ND	ND	ND
	B6-0.3	< 1.0	ND	ND	ND	ND
	B7-0.3	< 1.0	ND	---	ND	Aroclor-1254 = 136
1.5 m	B1-1.5	< 1.0	ND	ND	ND	Aroclor-1254 = 72
	B2-1.5	< 1.0	ND	ND	ND	ND
	B3-1.5	< 1.0	ND	ND	ND	ND
	B4-1.5	< 1.0	ND	ND	ND	ND
	B5-1.5	< 1.0	ND	ND	ND	ND
	B6-1.5	< 1.0	ND	ND	ND	ND
3.0 m	B1-3.0	< 1.0	ND	---	---	---
	B2-3.0	< 1.0	ND	---	---	---
	B3-3.0	< 1.0	ND	---	ND	ND
	B4-3.0	< 1.0	ND	---	---	---
	B6-3.0	< 1.0	ND	---	---	---
4.5 m	B1-4.5	< 1.0	ND	---	---	---

NOTE:

#	=	Insufficient sample volume to analyze.
**	=	The sample contains hydrocarbons in the mineral spirits to diesel fuel range but does not match the motor oil pattern. Quantitation is based on the motor oil standard.
***	=	The hydrocarbon range is broader than that of motor oil, similar to crude or hydraulic oil. Quantitation is based on motor oil.
---	=	Analysis not performed
<	=	Less than the laboratory reporting limit.
_g/kg	=	micrograms per kilogram
bgs	=	below ground surface
CAM 17	=	California Analysis Metals
Cu	=	Copper
ft	=	feet
m	=	meter
mg/kg	=	milligrams per kilogram
mg/L	=	milligrams per liter
ND	=	Constituents not detected at concentrations greater than respective laboratory reporting limits.
Pb	=	Lead
PCBs	=	Polychlorinated Biphenyls
TCLP	=	Toxicity Characteristic Leaching Potential
TPH-D	=	Total Petroleum Hydrocarbons measured as diesel
TPH-G	=	Total Petroleum Hydrocarbons measured as gasoline
TPH-MO	=	Total Petroleum Hydrocarbons measured as motor oil
Se	=	Selenium
SVOCs	=	Semivolatile Organic Compounds
VOCs	=	Volatile Organic Compounds
WET	=	Waste Extraction Test

Wherever the following terms are used in the contract documents, the meaning and intent shall be interpreted as provided below:

- A. Contaminated material – Material that contains contaminants at concentrations less than the threshold limit concentrations listed in Section 66261.24 of Title 22 of the California Code of Regulations, but that could, under ambient environmental conditions at a disposal site, be released in concentrations that exceed applicable water quality objectives or could degrade waters of the State.
- B. Hazardous material – Material that contains contaminants at concentrations equal to or greater than the threshold limit concentrations listed in Section 66261.24 of Title 22 of the California Code of Regulations, excluding Section 66261.24 (a) (1).
- C. Slag – Fused silica residue from primary copper processing that is exempt from regulation as a hazardous waste and has been classified as Group B mineral processing and beneficiation waste under Title 27, Division 2, of the California Code of Regulations.
- D. Cinder – Roasted pyrite residue from mineral processing that is exempt from regulation as a hazardous waste and has been classified as Group B mineral processing and beneficiation waste under Title 27, Division 2, of the California Code of Regulations.

Hazardous materials shall be transferred directly from the excavation to a registered transport vehicle, a storage container approved for transport of hazardous waste by the United States Department of Transportation, or a stockpile location approved by the Engineer. Contaminated materials, slag, and cinder shall be transferred directly from the excavation to a transport vehicle, a storage container, or a stockpile location approved by the Engineer. Stockpile locations for contaminated material shall be maintained in conformance with the provisions in “Water Pollution Control” of these special provisions. Stockpile locations for hazardous material, slag, and cinder shall be maintained as follows:

- A. The material shall not contain free liquids that separate readily from the material. The presence or absence of free liquids shall be demonstrated by United States Environmental Protection Agency Method 9095 as modified by Section 66264.314 of Title 22 of the California Code of Regulations.

- B. The material shall be stored on undamaged 1.5-mm high-density polyethylene or an equivalent impermeable barrier unless the stockpiling location is on a paved surface. If the location is on a paved surface the thickness of the barrier can be reduced to 0.5-mm high-density polyethylene or its equivalent. The dimensions of the barrier shall exceed the dimensions of the stockpile at all times. Any seams in the barrier shall be sealed to prevent leakage.
- C. At the end of each day the material shall be covered with undamaged 0.3-mm polyethylene or an equivalent impermeable barrier to prevent windblown dispersion and precipitation run-off and run-on. When more than one sheet is required to cover the material, the sheets shall be overlapped a minimum of 0.45-m in a manner that prevents water from flowing onto the material. The cover shall be secured in a manner that keeps it in place at all times. Driven anchors shall not be used except at the perimeter of the stockpile. The cover shall be inspected and maintained in conformance with the provisions in "Water Pollution Control" of these special provisions.

These stockpiling requirements apply to temporary storage outside of an excavation or a transport container including, but not limited to, staging of excavated material next to the excavation prior to pick up by loading equipment, accumulating material for full transport loads, and awaiting test results required by a disposal facility. The removal of stockpiles shall begin within 30 days of accumulating 100 kg of hazardous material. After final removal has occurred the Contractor shall be responsible for any cleanup deemed necessary by the Engineer.

Contaminated material, hazardous material, slag, and cinder on exteriors of transport vehicles shall be removed and placed either into the current transport vehicle or the excavation prior to the vehicle leaving the loading area. No contaminated material, hazardous material, slag, or cinder shall be deposited on public roads. The Contractor shall indemnify the State from any costs due to spillage during the transport of the contaminated material, hazardous material, slag, or cinder to the disposal facility.

The Contractor shall monitor the air quality continuously during excavation operations at all locations containing hazardous material.

Characterization and disposal of additional material resulting from excavations performed outside of the pay limits shown on the plans, specified in the Standard Specifications, or specified or directed by the Engineer, for the Contractor's convenience, shall be at the Contractor's expense. This resultant material shall be presumed to be either contaminated material or hazardous material if the test results for the location indicate that the material being excavated is contaminated material or hazardous material. Unless backfilling with the material is approved in writing by the Engineer, the Contractor shall dispose of the resultant material outside highway right of way in conformance with the provisions in "Earthwork" of these special provisions. When the material must be removed from highway right of way the Contractor shall furnish replacement material suitable for the purpose intended in conformance with the provisions in Section 19, "Earthwork," of the Standard Specifications.

APPLICABLE RULES AND REGULATIONS.—Excavation, transport and disposal of contaminated material, hazardous material, slag, and cinder shall be in conformance with the rules and regulations of the following agencies:

United States Department of Transportation (USDOT)
United States Environmental Protection Agency (USEPA)
California Environmental Protection Agency (CAL-EPA)
1. Department of Toxic Substance Control (DTSC)
2. Integrated Waste Management Board
3. Regional Water Quality Control Board, Region 2 (RWQCB)
4. State Air Resources Board
Bay Area Air Quality Management District (BAAQMD)
California Division of Occupational Safety and Health Administration (CAL-OSHA)

PERMITS AND LICENSES.—The Contractor shall procure all permits and licenses, pay all charges and fees, and give all notices necessary and incident to the due and lawful prosecution of the work, including registration for transporting vehicles carrying hazardous material, in conformance with the provisions in Section 7-1.04, "Permits and Licenses," of the Standard Specifications.

The Engineer will obtain the Environmental Protection Agency Generator Identification Number and Board of Equalization Identification Number and sign all manifests as the Generator.

SITE HEALTH AND SAFETY PLAN.—The Contractor shall prepare a detailed Site Health and Safety Plan for all site personnel, including State personnel, that identifies potential health and safety hazards associated with each operation and specifies work practices that will be used to protect workers from those hazards in conformance with the DTSC and CAL-OSHA regulations. At a minimum, the Site Health and Safety Plan shall identify key site safety personnel, describe risks associated with the work, describe training requirements, describe appropriate personal protective equipment, describe any site-specific medical surveillance requirements, describe any periodic air monitoring requirements, define appropriate site

work zones, and describe any decontamination requirements. The Site Health and Safety Plan shall be submitted at least 15 working days prior to beginning any excavation work for review and acceptance by the Engineer. Prior to submittal, the Contractor shall have the Site Health and Safety Plan approved by an Industrial Hygienist certified by the American Board of Industrial Hygiene. Subcontractors shall use the Site Health and Safety Plan prepared by the Contractor or prepare and submit a separate Site Health and Safety Plan in conformance with the provisions in this section.

SAFETY TRAINING.—Prior to performing any work, all personnel, including State personnel, shall complete a safety training program that communicates the potential health and safety hazards associated with work on the site and instructs the personnel in procedures for doing the work safely. The level of training provided shall be consistent with the personnel's job function and conform to CAL-OSHA regulations. The training, including subsequent training required until completion of the project, shall be provided by the Contractor. The Contractor shall provide a certification of completion of the Safety Training Program to all personnel. Personal protective equipment required by State personnel to inspect the work shall be provided by the Contractor. The number of State personnel requiring the above mentioned safety training program and personal protective equipment will be 15.

SAMPLING AND ANALYSIS.—The Contractor shall test the material to be excavated at his own expense for any additional acceptance requirements put forth by the disposal facility. Sampling and analysis shall be performed using the sampling and analysis procedure required by the disposal facility.

The Contractor may perform additional tests on the material to be excavated at his option and expense for confirmation of the classification as contaminated material or hazardous material. Sampling and analysis shall be based on guidelines in USEPA, SW 846, "Test Methods for Evaluating Solid Waste, Volume II: Field Manual Physical/Chemical Methods."

The Contractor shall submit, for approval by the Engineer, a Sampling and Analysis Plan that describes the scope of the investigation, along with the name, address, and certification number of the testing laboratory, 15 working days prior to beginning any sampling or analysis for additional disposal facility requirements, reclassification of material, or characterization of material outside of the excavation pay limits. The Sampling and Analysis Plan shall be prepared under the guidance of a registered professional experienced in site characterization. The Engineer will make the final decision on reclassification or characterization of material after review of the test data. Five working days shall be allowed for review of test data.

MEASUREMENT AND PAYMENT.—Full compensation for conforming to the requirements of this section shall be considered as included in the prices paid for the various contract items of work affected by this section and no additional compensation will be allowed therefor.

SECTION 6. (BLANK)

SECTION 7. (BLANK)

SECTION 8. MATERIALS

SECTION 8-1. MISCELLANEOUS

8-1.01 SUBSTITUTION OF NON-METRIC MATERIALS AND PRODUCTS

Only materials and products conforming to the requirements of the specifications shall be incorporated in the work. When metric materials and products are not available, and when approved by the Engineer, and at no cost to the State, materials and products in the inch-pound (Imperial) system which are of equal quality and of the required properties and characteristics for the purpose intended, may be substituted for the equivalent metric materials and products, subject to the following provisions:

- A. Materials and products shown on the plans or in the special provisions as being equivalent may be substituted for the metric materials and products specified or detailed on the plans.
- B. Before other non-metric materials and products will be considered for use the Contractor shall furnish, at the Contractor's expense, evidence satisfactory to the Engineer that the materials and products proposed for use are equal to or better than the materials and products specified or detailed on the plans. The burden of proof as to the quality and suitability of substitutions shall be upon the Contractor and the Contractor shall furnish necessary information as required by the Engineer. The Engineer will be the sole judge as to the quality and suitability of the substituted materials and products and the Engineer's decision will be final.

- C. When the Contractor elects to substitute non-metric materials and products, including materials and products shown on the plans or in the special provisions as being equivalent, the list of sources of material as specified in Section 6-1.01, "Source of Supply and Quality of Materials," of the Standard Specification shall include a list of substitutions to be made and contract items involved. In addition, for a change in design or details the Contractor shall submit plans and working drawings in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications.

Unless otherwise specified, the following substitutions of materials and products will be allowed:

SUBSTITUTION TABLE FOR SIZES OF HIGH STRENGTH STEEL FASTENERS

ASTM Designation: A 325M

METRIC SIZE SHOWN ON THE PLANS mm x thread pitch	IMPERIAL SIZE TO BE SUBSTITUTED inch
M16 x 2	5/8
M20 x 2.5	3/4
M22 x 2.5	7/8
M24 x 3	1
M27 x 3	1-1/8
M30 x 3.5	1-1/4
M36 x 4	1-1/2

SUBSTITUTION TABLE FOR PLAIN WIRE REINFORCEMENT, ASTM Designation: A 82

METRIC SIZE SHOWN ON THE PLANS mm ²	US CUSTOMARY UNITS SIZE TO BE SUBSTITUTED inch ² x 100
MW9	W1.4
MW10	W1.6
MW13	W2.0
MW15	W2.3
MW19	W2.9
MW20	W3.1
MW22	W3.5
MW25	W3.9, except W3.5 in piles only
MW26	W4.0
MW30	W4.7
MW32	W5.0
MW35	W5.4
MW40	W6.2
MW45	W6.5
MW50	W7.8
MW55	W8.5, except W8.0 in piles only
MW60	W9.3
MW70	W10.9, except W11.0 in piles only
MW80	W12.4
MW90	W14.0
MW100	W15.5

SUBSTITUTION TABLE FOR BAR REINFORCEMENT

METRIC BAR DESIGNATION NUMBER SHOWN ON THE PLANS	EQUIVALENT IMPERIAL BAR DESIGNATION NUMBER TO BE SUBSTITUTED
13	4
16	5
19	6
22	7
25	8
29	9
32	10
36	11
43	14
57	18

No adjustment will be required in spacing or total number of reinforcing bars due to a difference in minimum yield strength between metric and non-metric bars.

The sizes in the following tables of materials and products are exact conversions of metric sizes of materials and products and are listed as acceptable equivalents:

CONVERSION TABLE FOR SIZES OF:

- (1) STEEL FASTENERS FOR GENERAL APPLICATIONS, ASTM Designation: A 307 or AASHTO Designation: M 314, Grade 36 or 55, and
- (2) HIGH STRENGTH STEEL FASTENERS, ASTM Designation: A 325 or A 449

METRIC SIZE SHOWN ON THE PLANS mm	EQUIVALENT IMPERIAL SIZE inch
6, or 6.35	1/4
8 or 7.94	5/16
10, or 9.52	3/8
11, or 11.11	7/16
13 or 12.70	1/2
14, or 14.29	9/16
16, or 15.88	5/8
19, or 19.05	3/4
22, or 22.22	7/8
24, 25, or 25.40	1
29, or 28.58	1-1/8
32, or 31.75	1-1/4
35, or 34.93	1-3/8
38 or 38.10	1-1/2
44, or 44.45	1-3/4
51, or 50.80	2
57, or 57.15	2-1/4
64, or 63.50	2-1/2
70 or 69.85	2-3/4
76, or 76.20	3
83, or 82.55	3-1/4
89 or 88.90	3-1/2
95, or 95.25	3-3/4
102, or 101.60	4

CONVERSION TABLE FOR NOMINAL THICKNESS OF SHEET METAL

UNCOATED HOT AND COLD ROLLED SHEETS		HOT-DIPPED ZINC COATED SHEETS (GALVANIZED)	
METRIC THICKNESS SHOWN ON THE PLANS	EQUIVALENT US STANDARD GAGE	METRIC THICKNESS SHOWN ON THE PLANS	EQUIVALENT GALVANIZED SHEET GAGE
mm	inch	mm	inch
7.94	0.3125	4.270	0.1681
6.07	0.2391	3.891	0.1532
5.69	0.2242	3.510	0.1382
5.31	0.2092	3.132	0.1233
4.94	0.1943	2.753	0.1084
4.55	0.1793	2.372	0.0934
4.18	0.1644	1.994	0.0785
3.80	0.1495	1.803	0.0710
3.42	0.1345	1.613	0.0635
3.04	0.1196	1.461	0.0575
2.66	0.1046	1.311	0.0516
2.28	0.0897	1.158	0.0456
1.90	0.0747	1.006 or 1.016	0.0396
1.71	0.0673	0.930	0.0366
1.52	0.0598	0.853	0.0336
1.37	0.0538	0.777	0.0306
1.21	0.0478	0.701	0.0276
1.06	0.0418	0.627	0.0247
0.91	0.0359	0.551	0.0217
0.84	0.0329	0.513	0.0202
0.76	0.0299	0.475	0.0187
0.68	0.0269	-----	-----
0.61	0.0239	-----	-----
0.53	0.0209	-----	-----
0.45	0.0179	-----	-----
0.42	0.0164	-----	-----
0.38	0.0149	-----	-----

CONVERSION TABLE FOR WIRE

METRIC THICKNESS SHOWN ON THE PLANS mm	EQUIVALENT USA STEEL WIRE THICKNESS inch	GAGE NO.
6.20	0.244	3
5.72	0.225	4
5.26	0.207	5
4.88	0.192	6
4.50	0.177	7
4.11	0.162	8
3.76	0.148	9
3.43	0.135	10
3.05	0.120	11
2.69	0.106	12
2.34	0.092	13
2.03	0.080	14
1.83	0.072	15
1.57	0.062	16
1.37	0.054	17
1.22	0.048	18
1.04	0.041	19
0.89	0.035	20

CONVERSION TABLE FOR PIPE PILES

METRIC SIZE SHOWN ON THE PLANS mm x mm	EQUIVALENT IMPERIAL SIZE inch x inch
PP 360 x 4.55	NPS 14 x 0.179
PP 360 x 6.35	NPS 14 x 0.250
PP 360 x 9.53	NPS 14 x 0.375
PP 360 x 11.12	NPS 14 x 0.438
PP 406 x 12.70	NPS 16 x 0.500
PP 460 x T	NPS 18 x T"
PP 508 x T	NPS 20 x T"
PP 559 x T	NPS 22 x T"
PP 610 x T	NPS 24 x T"
PP 660 x T	NPS 26 x T"
PP 711 x T	NPS 28 x T"
PP 762 x T	NPS 30 x T"
PP 813 x T	NPS 32 x T"
PP 864 x T	NPS 34 x T"
PP 914 x T	NPS 36 x T"
PP 965 x T	NPS 38 x T"
PP 1016 x T	NPS 40 x T"
PP 1067 x T	NPS 42 x T"
PP 1118 x T	NPS 44 x T"
PP 1219 x T	NPS 48 x T"
PP 1524 x T	NPS 60 x T"

The thickness in inches (T") represents an exact conversion of the metric thickness in millimeters (T).

CONVERSION TABLE FOR STRUCTURAL TIMBER AND LUMBER

METRIC MINIMUM DRESSED DRY, SHOWN ON THE PLANS mm x mm	METRIC MINIMUM DRESSED GREEN, SHOWN ON THE PLANS mm x mm	EQUIVALENT NOMINAL US SIZE inch x inch
19x89	20x90	1x4
38x89	40x90	2x4
64x89	65x90	3x4
89x89	90x90	4x4
140x140	143x143	6x6
140x184	143x190	6x8
184x184	190x190	8x8
235x235	241x241	10x10
286x286	292x292	12x12

CONVERSION TABLE FOR NAILS AND SPIKES

METRIC COMMON NAIL, SHOWN ON THE PLANS Length, mm Diameter, mm	METRIC BOX NAIL, SHOWN ON THE PLANS Length, mm Diameter, mm	METRIC SPIKE, SHOWN ON THE PLANS Length, mm Diameter, mm	EQUIVALENT IMPERIAL SIZE Penny-weight
50.80 2.87	50.80 2.51	————	6d
63.50 3.33	63.50 2.87	————	8d
76.20 3.76	76.20 3.25	76.20 4.88	10d
82.55 3.76	82.55 3.25	82.55 4.88	12d
88.90 4.11	88.90 3.43	88.90 5.26	16d
101.60 4.88	101.60 3.76	101.60 5.72	20d
114.30 5.26	114.30 3.76	114.30 6.20	30d
127.00 5.72	127.00 4.11	127.00 6.68	40d
————	————	139.70 7.19	50d
————	————	152.40 7.19	60d

CONVERSION TABLE FOR IRRIGATION COMPONENTS

METRIC WATER METERS, TRUCK LOADING STANDPIPES, VALVES, BACKFLOW PREVENTERS, FLOW SENSORS, WYE STRAINERS, FILTER ASSEMBLY UNITS, PIPE SUPPLY LINES, AND PIPE IRRIGATION SUPPLY LINES SHOWN ON THE PLANS DIAMETER NOMINAL (DN) mm	EQUIVALENT NOMINAL US SIZE inch
15	1/2
20	3/4
25	1
32	1-1/4
40	1-1/2
50	2
65	2-1/2
75	3
100	4
150	6
200	8
250	10
300	12
350	14
400	16

8-1.02 APPROVED TRAFFIC PRODUCTS

The Department maintains the following list of Approved Traffic Products. The Engineer shall not be precluded from sampling and testing products on the list of Approved Traffic Products.

The manufacturer of products on the list of Approved Traffic Products shall furnish the Engineer a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for each type of traffic product supplied.

Signing and delineation materials and products shall not be used in the work unless the material or product is on the list of Approved Traffic Products.

Materials and products may be added to the list of Approved Traffic Products if the manufacturer submits a New Product Information Form to the New Product Coordinator at the Transportation Laboratory. Upon a Departmental request for samples, sufficient samples shall be submitted to permit performance of required tests. Approval of materials or products will depend upon compliance with the specifications and tests the Department may elect to perform.

PAVEMENT MARKERS, PERMANENT TYPE

Retroreflective

- A. Apex, Model 921 (100 mm x 100 mm)
- B. Ray-O-Lite, Models SS (100 mm x 100 mm), RS (100 mm x 100 mm) and AA (100 mm x 100 mm)
- C. Stimsonite, Models 88 (100 mm x 100 mm), 911 (100 mm x 100 mm), 953 (70 mm x 114 mm)
- D. 3M Series 290 (89 mm x 100 mm)

Retroreflective With Abrasion Resistant Surface (ARS)

- A. Ray-O-Lite "AA" ARS (100 mm x 100 mm)
- B. Stimsonite, Models 911 (100 mm x 100 mm), 953 (70 mm x 114 mm)
- C. 3M Series 290 (89 mm x 100 mm)

Retroreflective With Abrasion Resistant Surface (ARS)

(Used for recessed applications)

- A. Stimsonite, Model 948 (58 mm x 119 mm)
 - B. Ray-O-Lite, Model 2002 (58 mm x 117 mm)
 - C. Stimsonite, Model 944SB (51 mm x 100 mm)*
 - D. Ray-O-Lite, Model 2004 ARS (51 mm x 100 mm)*
- *For use only in 114 mm wide (older) recessed slots

Non-Reflective For Use With Epoxy Adhesive, 100 mm Round

- A. Apex Universal (Ceramic)
- B. Highway Ceramics, Inc. (Ceramic)

Non-Reflective For Use With Bitumen Adhesive, 100 mm Round

- A. Apex Universal (Ceramic)
- B. Apex Universal, Model 929 (ABS)
- C. Elgin Molded Plastics, "Empco-Lite" Model 900 (ABS)
- D. Highway Ceramics, Inc. (Ceramic)
- E. Hi-Way Safety, Inc., Models P20-2000W and 2001Y (ABS)
- F. Interstate Sales, "Diamond Back" (ABS) and (Polypropylene)
- G. Alpine Products, D-Dot (ABS)
- H. Road Creations, Model RCB4NR (Acrylic)

PAVEMENT MARKERS, TEMPORARY TYPE

Temporary Markers For Long Term Day/Night Use (6 months or less)

- A. Apex Universal, Model 924 (100 mm x 100 mm)
- B. Davidson Plastics Corp., Model 3.0 (100 mm x 100 mm)
- C. Elgin Molded Plastics, "Empco-Lite" Model 901 (100 mm x 100 mm)
- D. Road Creations, Model R41C (100 mm x 100 mm)
- E. Vega Molded Products "Temporary Road Marker" (75 mm x 100 mm)

Temporary Markers For Short Term Day/Night Use (14 days or less)

(For seal coat or chip seal applications, clear protective covers are required)

- A. Apex Universal, Model 932
- B. Davidson Plastics, Models T.O.M., T.R.P.M., and "HH" (High Heat)
- C. Hi-Way Safety, Inc., Model 1280/1281

STRIPING AND PAVEMENT MARKING MATERIALS

Permanent Traffic Striping and Pavement Marking Tape

- A. Advanced Traffic Marking, Series 300 and 400
- B. Brite-Line, Series 1000
- C. Swarco Industries, "Director 35" (For transverse application only)
- D. Swarco Industries, "Director 60"
- E. 3M, "Stamark" Series 380 and 5730
- F. 3M, "Stamark" Series 420 (For transverse application only)

Temporary (Removable) Striping and Pavement Marking Tape (6 months or less)

- A. Brite-Line, Series 100
- B. P.B. Laminations, Aztec, Grade 102
- C. Swarco Industries, "Director-2"
- D. 3M, "Stamark," Series 620
- E. 3M Series A145 Removable Black Line Mask
(Black Tape: For use only on Asphalt Concrete Surfaces)
- F. Advanced Traffic Marking Black "Hide-A-Line"
(Black Tape: For use only on Asphalt Concrete Surfaces)

Preformed Thermoplastic (Heated in place)

- A. Flint Trading, "Premark" and "Premark 20/20 Flex"
- B. Pavemark, "Hotape"

Removable Traffic Paint

- A. Belpro, Series 250/252 and No. 93 Remover

CLASS 1 DELINEATORS

One Piece Driveable Flexible Type, 1700 mm

- A. Carsonite, Curve-Flex CFRM-400
- B. Carsonite, Roadmarker CRM-375
- C. Davidson Plastics, "Flexi-Guide Models 400 and 566"
- D. FlexStake, Model 654TM
- E. GreenLine Models HWD1-66 and CGD1-66
- F. J. Miller Industries, Model JMI-375 (with soil anchor)

Special Use Flexible Type, 1700 mm

- A. Carsonite, "Survivor" (with 450 mm U-Channel base)
- B. FlexStake, Model 604
- C. GreenLine Models HWD and CGD (with 450 mm U-Channel base)
- D. Safe-Hit with 200 mm pavement anchor (SH248-GP1)
- E. Safe-Hit with 380 mm soil anchor (SH248-GP2) and with 450 mm soil anchor (SH248-GP3)

Surface Mount Flexible Type, 1200 mm

- A. Bent Manufacturing Company, "Masterflex" Model MF-180EX-48
- B. Carsonite, "Super Duck II"
- C. FlexStake, Surface Mount, Models 704 and 754TM

CHANNELIZERS

Surface Mount Type, 900 mm

- A. Bent Manufacturing Company, "Masterflex" Models MF-360-36 (Round) and MF-180-36 (Flat)
- B. Carsonite, "Super Duck" (Flat SDF-436, Round SDR-336)
- C. Carsonite, "Super Duck II" Model SDCF203601MB "The Channelizer"
- D. Davidson Plastics, Flex-Guide Models FG300LD and FG300UR
- E. FlexStake, Surface Mount, Models 703 and 753TM
- F. GreenLine, Model SMD-36
- G. Hi-Way Safety, Inc. "Channel Guide Channelizer" Model CGC36
- H. The Line Connection, "Dura-Post" Model DP36-3 (Permanent)
- I. The Line Connection, "Dura-Post" Model DP36-3C (Temporary)
- J. Repo, Models 300 and 400
- K. Safe-Hit, Guide Post, Model SH236SMA

CONICAL DELINEATORS, 1070 mm

(For 700 mm Traffic Cones, see Standard Specifications)

- A. Bent Manufacturing Company "T-Top"
- B. Plastic Safety Systems "Navigator-42"
- C. Roadmaker Company "Stacker"
- D. Traffix Devices "Grabber"

OBJECT MARKERS

Type "K", 450 mm

- A. Carsonite, Model SMD-615
- B. FlexStake, Model 701KM
- C. Repo, Models 300 and 400
- D. Safe-Hit, Model SH718SMA
- E. The Line Connection, Model DP21-4K

Type "K-4" / "Q", 600 mm

(Shown as Type "Q" in the Traffic Manual)

- A. Bent Manufacturing "Masterflex" Model MF-360-24
- B. Carsonite, Super Duck II
- C. FlexStake, Model 701KM
- D. Repo, Models 300 and 400
- E. Safe-Hit, Models SH8 24SMA_WA and SH8 24GP3_WA
- F. The Line Connection, Model DP21-4Q

TEMPORARY RAILING (TYPE K) REFLECTORS AND CONCRETE BARRIER MARKERS

Impactable Type

- A. ARTUK, "FB"
- B. Davidson Plastics, Model PCBM-12
- C. Duraflex Corp., "Flexx 2020" and "Electriflexx"
- D. Hi-Way Safety, Inc., Model GMKRM100

Non-Impactable Type

- A. ARTUK, JD Series
- B. Stimsonite, Model 967 (with 83 mm Acrylic cube corner reflector)
- C. Stimsonite, Model 967LS
- D. Vega Molded Products, Models GBM and JD

THREE BEAM BARRIER MARKERS

(For use to the left of traffic)

- A. Duraflex Corp., "Railrider"
- B. Davidson Plastics, "Mini" (75 mm x 254 mm)

CONCRETE BARRIER DELINEATORS, 400 mm

(For use to the right of traffic. When mounted on top of barrier, places top of reflective element at 1200 mm)

- A. Davidson Plastics, Model PCBM T-16
- B. Safe-Hit, Model SH216RBM

CONCRETE BARRIER-MOUNTED MINI-DRUM (260 mm x 360 mm x 570 mm)

- A. Stinson Equipment Company "SaddleMarker"

SOUND WALL DELINEATOR

(Applied to a vertical surface. Top of reflective element at 1200 mm)

- A. Davidson Plastics, PCBM S-36

GUARD RAILING DELINEATOR

(Top of reflective element at 1200 mm above plane of roadway)

Wood Post Type, 686 mm

- A. Carsonite, Model 427
- B. Davidson Plastics FG 427 and FG 527
- C. FlexStake, Model 102 GR
- D. GreenLine GRD 27
- E. J. Miller Model JMI-375G
- F. Safe-Hit, Model SH227GRD

Steel Post Type

- A. Carsonite, Model CFGR-327 with CFGRBK300 Mounting Bracket

RETROREFLECTIVE SHEETING

Channelizers, Barrier Markers, and Delineators

- A. 3M, High Intensity
- B. Reflexite, PC-1000 Metalized Polycarbonate
- C. Reflexite, AC-1000 Acrylic
- D. Reflexite, AP-1000 Metalized Polyester
- E. Reflexite, AR-1000 Abrasion Resistant Coating
- F. Stimsonite, Series 6200 (For rigid substrate devices only)

Traffic Cones, 330 mm Sleeves

- A. Reflexite SB (Polyester), Vinyl or "TR" (Semi-transparent)

Traffic Cones, 100 mm and 150 mm Sleeves

- A. 3M Series 3840
- B. Reflexite Vinyl, "TR" (Semi-transparent) or "Conformalite"

Barrels and Drums

- A. Reflexite, "Super High Intensity" or "High Impact Drum Sheeting"
- B. 3M Series 3810

Barricades: Type I, Engineer Grade

- A. American Decal, Adcolite
- B. Avery Dennison, 1500 and 1600
- C. 3M, Scotchlite, Series CW

Barricades: Type II, Super Engineer Grade

- A. Avery Dennison, "Fasign" 2500 Series
- B. Kiwalite Type II
- C. Nikkalite 1800 Series

Signs: Type II, Super Engineer Grade

- A. Avery Dennison, "Fasign" 2500 Series
- B. Kiwalite, Type II
- C. Nikkalite 1800 Series

Signs: Type III, High-Intensity Grade

- A. 3M Series 3800
- B. Nippon Carbide, Nikkalite Brand Ultralite Grade II

Signs: Type IV, High-Intensity Prismatic Grade

- A. Stimsonite Series 6200

Signs: Type VII, High-Intensity Prismatic Grade

- A. 3M Series 3900

Signs: Type VI, Roll-Up Signs

- A. Reflexite, Vinyl (Orange), Reflexite "SuperBright" (Fluorescent orange)
- B. 3M Series RS34 (Orange) and RS20 (Fluorescent orange)

SIGN SUBSTRATE FOR CONSTRUCTION AREA SIGNS

Aluminum

Fiberglass Reinforced Plastic (FRP)

- A. Sequentia, "Polyplate"
- B. Fiber-Brite

8-1.03 STATE-FURNISHED MATERIALS

Attention is directed to Section 6-1.02, "State-Furnished Materials," of the Standard Specifications, and Section 10-4 "Seismic Monitoring System And Health Monitoring System Work" of these special provisions.

The following materials will be furnished to the Contractor:

- A. Sign panels for roadside signs and overhead sign structures.
- B. Sign overlay panels for roadside signs and overhead sign structures.
- C. Laminated wood box posts with metal caps for roadside signs.
- D. Hardware for mounting sign panels as follows:
 - 1. Blind rivets for mounting overlapping legend at sign panel joints.
 - 2. Closure inserts.
 - 3. Aluminum bolts and nuts and steel beveled washers for mounting laminated sign panels on overhead sign structures.
 - 4. Aluminum bolts, nuts, and washers for mounting overhead formed panels.
- E. Padlocks for backflow preventer assembly enclosures, walk gates, and irrigation controller enclosure cabinets.
- F. Disks for survey monuments.
- G. Marker panels, including reflectors, for Type N, Type P, and Type R object markers.
- H. Lamps for vehicular traffic signal units (yellow sections, green sections and green arrows only) and Type A pedestrian signals.
- I. Loop detector sensors units.

Attention is directed to Section 10-4.01, "General," for additional material to be supplied to the Contractor for the seismic monitoring system and health monitoring system.

8-1.04 ENGINEERING FABRICS

Engineering fabrics shall conform to the provisions in Section 88, "Engineering Fabrics," of the Standard Specifications and these special provisions.

Filter fabric for this project shall be ultraviolet (UV) ray protected.

SECTION 8-2. CONCRETE

8-2.01 PORTLAND CEMENT CONCRETE

Portland cement concrete shall conform to the provisions in Section 90, "Portland Cement Concrete," of the Standard Specifications and these special provisions.

Unless the use of a mineral admixture is prohibited, whenever the word "cement" is used in the Standard Specifications or the special provisions, it shall be understood to mean "cementitious material" when both of the following conditions are met:

- A. The cement content of portland cement concrete is specified, and
- B. Section 90, "Portland Cement Concrete," of the Standard Specifications is referenced.

The batch plant producing the portland cement concrete for the project shall have met the requirements in California Test 109 within one year prior to producing concrete for the project.

Unless otherwise specified, a Type C accelerating chemical admixture conforming to the requirements in ASTM Designation: C 494 may be used in portland cement concrete for precast steam cured concrete members.

Section 90-1.01, "Description," of the Standard Specifications is amended to read:

90-1.01 DESCRIPTION

- Portland cement concrete shall be composed of cementitious material, fine aggregate, coarse aggregate, admixtures if used, and water, proportioned and mixed as specified in these specifications.
- Unless otherwise specified, cementitious material to be used in portland cement concrete shall conform to the provisions for cement and mineral admixtures in Section 90-2, "Materials," and shall be either: 1) "Type IP (MS) Modified" cement or 2) a combination of "Type II Modified" portland cement and mineral admixture.

- Concrete for each portion of the work shall comply with the provisions for the Class, cementitious material content in kilograms per cubic meter, 28-day compressive strength, minor concrete or commercial quality concrete, as shown on the plans or specified in these specifications or the special provisions.
- Class 1 concrete shall contain not less than 400 kg of cementitious material per cubic meter.
- Class 2 concrete shall contain not less than 350 kg of cementitious material per cubic meter.
- Class 3 concrete shall contain not less than 300 kg of cementitious material per cubic meter.
- Class 4 concrete shall contain not less than 250 kg of cementitious material per cubic meter.
- Minor concrete shall contain not less than 325 kg of cementitious material per cubic meter unless otherwise specified in these specifications or the special provisions.
- Unless otherwise designated on the plans or specified in these specifications or the special provisions, the amount of cementitious material used per cubic meter of concrete in structures or portions of structures shall conform to the following:

Use	Cementitious Material Content (kg/m ³)
Concrete which is designated by compressive strength:	
Deck slabs and slab spans of bridges	400 min., 475 max.. (except lightweight concrete 550 max.)
Roof sections of exposed top box culverts	400 min., 475 max.
Other portions of structures	350 min., 475 max., (except lightweight concrete 550 max.)
Concrete not designated by compressive strength:	
Deck slabs and slab spans of bridges	400 min.
Roof sections of exposed top box culverts	400 min.
Prestressed members	400 min.
Seal courses	400 min.
Other portions of structures	350 min.
Concrete for precast members	350 min., 550 max.

- Whenever the 28-day compressive strength shown on the plans is greater than 25 MPa, the concrete shall be considered to be designated by compressive strength. If the plans show a 28-day compressive strength which is 31 MPa or greater, an additional 7 days will be allowed to obtain the specified strength. For concrete defined as mass concrete that is to be placed in the footings and precast pier footing forms, an additional 28 days will be allowed to obtain the specified strength. The Contractor's attention is directed to "Mass Concrete" of these special provisions. The 28-day compressive strengths shown on the plans which are 25 MPa or less are shown for design information only and are not to be considered a requirement for acceptance of the concrete.
- Concrete designated by compressive strength shall be proportioned such that the concrete will conform to the strength shown on the plans or specified in the special provisions.
- The Contractor shall determine the mix proportions for all concrete except pavement concrete. The Engineer will determine the mix proportions for pavement concrete.
- Before using concrete for which the mix proportions have been determined by the Contractor, or in advance of revising those mix proportions, the Contractor shall submit in writing to the Engineer a copy of the mix design.
- Compliance with cementitious material content requirements will be verified in conformance with procedures described in California Test 518 for cement content. For testing purposes, mineral admixture shall be considered to be cement. Batch proportions shall be adjusted as necessary to produce concrete having the specified cementitious material content.
- If any concrete used in the work has a cementitious material content, consisting of cement, mineral admixture, or cement plus mineral admixture, which is less than the minimum required for the work, the concrete shall be removed. However, if the Engineer determines that the concrete is structurally adequate, the concrete may remain in place and the Contractor shall pay to the State \$0.55 for each kilogram of cement, mineral admixture, or cement plus mineral admixture which is less than the minimum required for the work. The Department may deduct the amount from moneys due, or that may become due, the Contractor under the contract. The deductions will not be made unless the difference between the contents required and those actually provided exceeds the batching tolerances permitted by Section 90-5, "Proportioning." No deductions for cementitious material content will be made based on the results of California Test 518.
- The requirements of the preceding paragraph shall not apply to minor concrete or commercial quality concrete.
- Concrete for which the mix proportions are determined either by the Contractor or the Engineer shall conform to the requirements of this Section 90.

The first paragraph in Section 90-2.01, "Portland Cement," of the Standard Specifications is amended to read:

90-2.01 PORTLAND CEMENT

- Unless otherwise specified, portland cement shall be either "Type IP (MS) Modified" cement or "Type II Modified" portland cement.
- "Type IP (MS) Modified" cement shall conform to the specifications for Type IP (MS) cement in ASTM Designation: C 595, and shall be comprised of an intimate mixture of Type II cement and not more than 25 percent of a mineral admixture. The type and minimum amount of mineral admixture used in the manufacture of "Type IP (MS) Modified" cement shall be in conformance with the provisions in Section 90-4.08, "Required Use of Mineral Admixtures."
- "Type II Modified" portland cement shall conform to the requirements for Type II portland cement in ASTM Designation: C 150.
- In addition, "Type IP (MS) Modified" cement and "Type II Modified" portland cement shall conform to the following requirements:
 - A. The cement shall not contain more than 0.60 percent by mass of alkalis, calculated as the percentage of Na₂O plus 0.658 times the percentage of K₂O, when determined by either direct intensity flame photometry or by the atomic absorption method. The instrument and procedure used shall be qualified as to precision and accuracy in conformance with the requirements in ASTM Designation: C 114.
 - B. The autoclave expansion shall not exceed 0.50 percent.
 - C. Mortar, containing the cement to be used and Ottawa sand, when tested in conformance with California Test 527, shall not expand in water more than 0.010 percent and shall not contract in air more than 0.048 percent except that when cement is to be used for precast prestressed concrete piling, precast prestressed concrete members or steam cured concrete products, the mortar shall not contract in air more than 0.053 percent.

The second paragraph in Section 90-2.01, "Portland Cement," of the Standard Specifications is amended to read:

- Type III and Type V portland cements shall conform to the requirements in ASTM Designation: C 150, and the additional requirements listed above for Type II Modified portland cement, except that when tested in conformance with California Test 527, mortar containing Type III portland cement shall not contract in air more than 0.075 percent.

The third paragraph in Section 90-2.01, "Portland Cement," of the Standard Specifications is deleted.

The twelfth paragraph in Section 90-2.02, "Aggregates," of the Standard Specifications is deleted.

The first paragraph in Section 90-2.03, "Water," of the Standard Specifications is amended to read:

90-2.03 WATER

- In conventionally reinforced concrete work, the water for curing, for washing aggregates, and for mixing shall be free from oil and shall not contain more than 1,000 parts per million of chlorides as Cl, nor more than 1,300 parts per million of sulfates as SO₄. In prestressed concrete work, the water for curing, for washing aggregates, and for mixing shall be free from oil and shall not contain more than 650 parts per million of chlorides as Cl, nor more than 1,300 parts per million of sulfates as SO₄. The maximum chloride ion content of all concrete for the Benicia Martinez Bridge and OH shall not be more than 0.15% by weight of the cementitious materials. In no case shall the water contain an amount of impurities that will cause either: 1) a change in the setting time of cement of more than 25 percent when tested in conformance with the requirements in ASTM Designation: C 191 or ASTM Designation: C 266 or 2) a reduction in the compressive strength of mortar at 14 days of more than 5 percent, when tested in conformance with the requirements in ASTM Designation: C 109, when compared to the results obtained with distilled water or deionized water, tested in conformance with the requirements in ASTM Designation: C 109.

The following section is added to Section 90-2, "Materials," of the Standard Specifications:

90-2.04 ADMIXTURE MATERIALS

- Admixture materials shall conform to the requirements in the following ASTM Designations:
 - A. Chemical Admixtures—ASTM Designation: C 494.
 - B. Air-entraining Admixtures—ASTM Designation: C 260.
 - C. Calcium Chloride—ASTM Designation: D 98.
 - D. Mineral Admixtures—Coal fly ash, raw or calcined natural pozzolan as specified in ASTM Designation: C 618. Silica fume conforming to the requirements in ASTM Designation: C 1240, with reduction of mortar expansion of

80 percent, minimum, using the cement from the proposed mix design. Metakaolin, an amorphous, aluminosilicate, if used, shall conform to ASTM Designation: C-618, Class N.

- Mineral admixtures shall be used in conformance with the provisions in Section 90-4.08, "Required Use of Mineral Admixtures."

The first paragraph in Section 90-3.03, "Fine Aggregate Grading," is amended to read:

Fine aggregate shall be graded within the following limits:

Sieve Sizes	Percentage Passing	
	Operating Range	Contract Compliance
9.5-mm	100	100
4.75-mm	95-100	93-100
2.36-mm	65-95	61-99
1.18-mm	$X \pm 10$	$X \pm 13$
600- μ m	$X \pm 9$	$X \pm 12$
300- μ m	$X \pm 6$	$X \pm 9$
150- μ m	2-12	1-15
75- μ m	0-8	0-10

Section 90-4.02, "Materials," of the Standard Specifications is amended to read:

90-4.02 MATERIALS

- Admixture materials shall conform to the provisions in Section 90-2.04, "Admixture Materials."

Section 90-4.05, "Optional Use of Chemical Admixtures," of the Standard Specifications is amended to read:

90-4.05 OPTIONAL USE OF CHEMICAL ADMIXTURES

- The Contractor will be permitted to use Type A or F, water-reducing; Type B, retarding; or Type D or G, water-reducing and retarding admixtures as described in ASTM Designation: C 494 to conserve cementitious material or to facilitate concrete construction application subject to the following conditions:
 - A. When a water-reducing admixture or a water-reducing and retarding admixture is used, the cementitious material content specified or ordered may be reduced by a maximum of 5 percent by mass except that the resultant cementitious material content shall be not less than 300 kilograms per cubic meter.
 - B. When a reduction in cementitious material content is made, the dosage of admixture used shall be the dosage used in determining approval of the admixture.

Section 90-4.07, "Optional Use of Air-entraining Admixtures," of the Standard Specifications is amended to read:

90-4.07 OPTIONAL USE OF AIR-ENTRAINING ADMIXTURES

- When air-entrainment has not been specified or ordered by the Engineer, the Contractor will be permitted to use an air-entraining admixture to facilitate the use of any construction procedure or equipment provided that the average air content, as determined by California Test 504, of 3 successive tests does not exceed 4 percent and no single test value exceeds 5.5 percent. If the Contractor elects to use an air-entraining admixture in concrete for pavement, the Contractor shall so indicate at the time the Contractor designates the source of aggregate as provided in Section 40-1.015, "Cement Content."

Section 90-4.08, "Required Use of Mineral Admixtures," of the Standard Specifications is amended to read:

90-4.08 REQUIRED USE OF MINERAL ADMIXTURES

- Unless otherwise specified, mineral admixture shall be combined with cement to make cementitious material for use in portland cement concrete.
- The calcium oxide content of mineral admixtures shall not exceed 10 percent and the available alkali, as sodium oxide equivalent, shall not exceed 1.5 percent when determined in conformance with the requirements in ASTM Designation: C618.

- The amounts of cement and mineral admixture used in cementitious material for portland cement concrete shall be sufficient to satisfy the minimum cementitious material content requirements specified in Section 90-1.01, "Description," or Section 90-4.05, "Optional Use of Chemical Admixtures," and shall conform to the following:

- A. The minimum amount of cement shall not be less than 75 percent by mass of the specified minimum cementitious material content.
- B. The minimum amount of mineral admixture to be combined with cement shall be determined using one of the following criteria:
 1. When the calcium oxide content of a mineral admixture, as determined in conformance with the requirements in ASTM Designation: C618 and the provisions in Section 90-2.04, "Admixture Materials," is equal to or less than 2 percent by mass, the amount of mineral admixture shall not be less than 15 percent by mass of the total amount of cementitious material to be used in the mix. If the Contractor elects to use amorphous aluminosilicate mineral admixture (metakaolin) in lightweight concrete, and it has a calcium oxide content less than 1 percent by mass, and the total amount of silica and alumina oxides is greater than 85 percent by mass, then the amount of metakaolin admixture shall not be less than 10 percent by mass of the total amount of cementitious material to be used in the mix. The Contractor shall submit certified laboratory analysis showing conformance to these requirements if metakaolin is used. In addition, the Contractor shall obtain approval of the metakaolin in accordance with 90-4.03, "Admixture Approval," of the Standard Specifications.
 2. When the calcium oxide content of a mineral admixture, as determined in conformance with the requirements in ASTM Designation: C618 and the provisions in Section 90-2.04, "Admixture Materials," is greater than 2 percent, the amount of mineral admixture shall not be less than 25 percent by mass of the total amount of cementitious material to be used in the mix.
 3. When a mineral admixture is used, which conforms to the provisions for silica fume in Section 90-2.04, "Admixture Materials," the amount of mineral admixture shall not be less than 10 percent by mass of the total amount of cementitious material to be used in the mix.
- C. If more than the required amount of cementitious material is used, the additional cementitious material in the mix may be either cement, a mineral admixture conforming to the provisions in Section 90-2.04, "Admixture Materials," or a combination of both; however, the maximum total amount of mineral admixture shall not exceed 35 percent by mass of the total amount of cementitious material to be used in the mix. Where Section 90-1.01, "Description," specifies a maximum cementitious content in kilograms per cubic meter, the total mass of cement and mineral admixture per cubic meter shall not exceed the specified maximum cementitious material content.

Section 90-4.09, "Optional Use of Mineral Admixtures," of the Standard Specifications is deleted.

Section 90-4.11, "Storage, Proportioning, and Dispensing of Mineral Admixtures," of the Standard Specifications is amended to read:

90-4.11 STORAGE, PROPORTIONING, AND DISPENSING OF MINERAL ADMIXTURES

- Mineral admixtures shall be protected from exposure to moisture until used. Sacked material shall be piled to permit access for tally, inspection, and identification for each shipment.
- Adequate facilities shall be provided to assure that mineral admixtures meeting the specified requirements are kept separate from other mineral admixtures in order to prevent any but the specified mineral admixtures from entering the work. Safe and suitable facilities for sampling mineral admixtures shall be provided at the weigh hopper or in the feed line immediately in advance of the hopper.
- Mineral admixtures shall be incorporated into concrete using equipment conforming to the requirements for cement weigh hoppers, and charging and discharging mechanisms in ASTM Designation: C 94, in Section 90-5.03, "Proportioning," and in this Section 90-4.11.
- When interlocks are required for cement and mineral admixture charging mechanisms by Section 90-5.03A, "Proportioning for Pavement," and cement and mineral admixtures are weighed cumulatively, their charging mechanisms shall be interlocked to prevent the introduction of mineral admixture until the mass of cement in the cement weigh hopper is within the tolerances specified in Section 90-5.02, "Proportioning Devices."
- Mineral admixture used in concrete for exposed surfaces of like elements of a structure shall be from the same source and of the same percentage.

Section 90-5.02, "Proportioning Devices," of the Standard Specifications is amended to read:

90-5.02 PROPORTIONING DEVICES

- Weighing, measuring or metering devices used for proportioning materials shall conform to the provisions in Section 9-1.01, "Measurement of Quantities," and this Section 90-5.02. In addition, automatic weighing systems used shall comply with the provisions for automatic proportioning devices in Section 90-5.03A, "Proportioning for Pavement." These automatic devices shall be automatic to the extent that the only manual operation required for proportioning the aggregates, cement, and mineral admixture for one batch of concrete is a single operation of a switch or starter.

- Proportioning devices shall be tested at the expense of the Contractor as frequently as the Engineer may deem necessary to insure their accuracy.

- Weighing equipment shall be insulated against vibration or movement of other operating equipment in the plant. When the plant is in operation, the mass of each batch of material shall not vary from the mass designated by the Engineer by more than the tolerances specified herein.

- Equipment for cumulative weighing of aggregate shall have a zero tolerance of ± 0.5 percent of the designated total batch mass of the aggregate. For systems with individual weigh hoppers for the various sizes of aggregate, the zero tolerance shall be ± 0.5 percent of the individual batch mass designated for each size of aggregate. Equipment for cumulative weighing of cement and mineral admixtures shall have a zero tolerance of ± 0.5 percent of the designated total batch mass of the cement and mineral admixture. Equipment for weighing cement or mineral admixture separately shall have a zero tolerance of ± 0.5 percent of their designated individual batch masses. Equipment for measuring water shall have a zero tolerance of ± 0.5 percent of its designated mass or volume.

- The mass indicated for a batch of material shall not vary from the preselected scale setting by more than the following:

- A. Aggregate weighed cumulatively shall be within 1.0 percent of the designated total batch mass of the aggregate. Aggregates weighed individually shall be within 1.5 percent of their respective designated batch masses.
- B. Cement shall be within 1.0 percent of its designated batch mass. When weighed individually, mineral admixture shall be within 1.0 percent of its designated batch mass. When mineral admixture and cement are permitted to be weighed cumulatively, cement shall be weighed first to within 1.0 percent of its designated batch mass, and the total for cement and mineral admixture shall be within 1.0 percent of the sum of their designated batch masses.
- C. Water shall be within 1.5 percent of its designated mass or volume.

- Each scale graduation shall be approximately 0.001 of the total capacity of the scale. The capacity of scales for weighing cement, mineral admixture, or cement plus mineral admixture and aggregates shall not exceed that of commercially available scales having single graduations indicating a mass not exceeding the maximum permissible mass variation above, except that no scale shall be required having a capacity of less than 500 kg, with 0.5 kg graduations.

Section 90-5.03, "Proportioning," excluding Section 90-5.03A, "Proportioning for Pavement," of the Standard Specifications is amended to read:

90-5.03 PROPORTIONING

- Proportioning shall consist of dividing the aggregates into the specified sizes, each stored in a separate bin, and combining them with cement, mineral admixture, and water as provided in these specifications. Aggregates shall be proportioned by mass.

- At the time of batching, aggregates shall have been dried or drained sufficiently to result in a stable moisture content such that no visible separation of water from aggregate will take place during transportation from the proportioning plant to the point of mixing. In no event shall the free moisture content of the fine aggregate at the time of batching exceed 8 percent of its saturated, surface-dry mass.

- Should separate supplies of aggregate material of the same size group, but of different moisture content or specific gravity or surface characteristics affecting workability, be available at the proportioning plant, withdrawals shall be made from one supply exclusively and the materials therein completely exhausted before starting upon another.

- Bulk "Type IP (MS) Modified" cement that conforms to the provisions in Section 90-2.01, "Portland Cement," shall be weighed in an individual hopper and shall be kept separate from the aggregates until the ingredients are released for discharge into the mixer.

- Bulk cement to be blended with mineral admixture for use in portland cement concrete for pavement and structures may be weighed in separate, individual weigh hoppers or may be weighed in the same weigh hopper with mineral admixture and shall be kept separate from the aggregates until the ingredients are released for discharge into the mixer. If the cement and mineral admixture are weighed cumulatively, the cement shall be weighed first.

- When cement and mineral admixtures are weighed in separate weigh hoppers, the weigh systems for the proportioning of the aggregate, the cement, and the mineral admixture shall be individual and distinct from other weigh systems. Each weigh system shall be equipped with a hopper, a lever system, and an indicator to constitute an individual and

independent material weighing device. The cement and the mineral admixture shall be discharged into the mixer simultaneously with the aggregate.

- The scale and weigh hopper for bulk weighing cement, mineral admixture, and cement plus mineral admixture shall be separate and distinct from the aggregate weighing equipment.

- When the source of an aggregate is changed for concrete structures, the Contractor shall adjust the mix proportions and submit in writing to the Engineer a copy of the mix design before using such aggregates. When the source of an aggregate is changed for other concrete, the Engineer shall be allowed sufficient time to adjust the mix and such aggregates shall not be used until necessary adjustments are made.

- For batches with a volume of one cubic meter or more, the batching equipment shall conform to one of the following combinations:

- A. Separate boxes and separate scale and indicator for weighing each size of aggregate.
- B. Single box and scale indicator for all aggregates.
- C. Single box or separate boxes and automatic weighing mechanism for all aggregates.

- In order to check the accuracy of batch masses, the gross mass and tare mass of batch trucks, truck mixers, truck agitators, and non-agitating hauling equipment shall be determined when ordered by the Engineer. The equipment shall be weighed at the Contractor's expense on scales designated by the Engineer.

Section 90-5.03A, "Proportioning for Pavement," of the Standard Specifications is amended to read:

90-5.03A PROPORTIONING FOR PAVEMENT

- Aggregates and bulk cement, mineral admixture, and cement plus mineral admixture for use in pavement shall be proportioned by mass by means of automatic proportioning devices of approved type conforming to the provisions in this Section 90-5.03A.

- The Contractor shall install and maintain in operating condition an electrically actuated moisture meter that will indicate, on a readily visible scale, changes in the moisture content of the fine aggregate as it is batched within a sensitivity of 0.5 percent by mass of the fine aggregate.

- The batching of cement, mineral admixture, or cement plus mineral admixture and aggregate shall be interlocked so that a new batch cannot be started until all weigh hoppers are empty, the proportioning devices are within zero tolerance, and the discharge gates are closed. The interlock shall permit no part of the batch to be discharged until all aggregate hoppers and the cement and mineral admixture hoppers or the cement plus mineral admixture hopper are charged with masses which are within the tolerances specified in Section 90-5.02, "Proportioning Devices."

- The discharge gate on the cement and mineral admixture hoppers or the cement plus mineral admixture hopper shall be designed to permit regulating the flow of cement, mineral admixture or cement plus mineral admixture into the aggregate as directed by the Engineer.

- When separate weigh boxes are used for each size of aggregate, the discharge gates shall permit regulating the flow of each size of aggregate as directed by the Engineer.

- Material discharged from the several bins shall be controlled by gates or by mechanical conveyors. The means of withdrawal from the several bins, and of discharge from the weigh box, shall be interlocked so that not more than one bin can discharge at a time, and that the weigh box cannot be tripped until the required quantity from each of the several bins has been deposited therein. Should a separate weigh box be used for each size of aggregate, all may be operated and discharged simultaneously.

- When the discharge from the several bins is controlled by gates, each gate shall be actuated automatically so that the required mass is discharged into the weigh box, after which the gate shall automatically close and lock.

- The automatic weighing system shall be designed so that all proportions required may be set on the weighing controller at the same time.

The third paragraph in Section 90-6.01, "General," of the Standard Specifications is amended to read:

- Concrete shall be homogeneous and thoroughly mixed. There shall be no lumps or evidence of undispersed cement, mineral admixture, or cement plus mineral admixture.

The third and fourth paragraphs in Section 90-6.02, "Machine Mixing," of the Standard Specifications are amended to read:

- The batch shall be so charged into the mixer that some water will enter in advance of cementitious materials and aggregates. All water shall be in the drum by the end of the first one-fourth of the specified mixing time.

- Cementitious materials shall be batched and charged into the mixer by means that will not result either in loss of cementitious materials due to the effect of wind, or in accumulation of cementitious materials on surfaces of conveyors or hoppers, or in other conditions which reduce or vary the required quantity of cementitious material in the concrete mixture.

The sixth paragraph in Section 90-6.02, "Machine Mixing," of the Standard Specifications is amended to read:

- The total elapsed time between the intermingling of damp aggregates and all cementitious materials and the start of mixing shall not exceed 30 minutes.

The seventh through tenth paragraphs in Section 90-6.03, "Transporting Mixed Concrete," of the Standard Specifications are amended to read:

- When a truck mixer or agitator is used for transporting concrete to the delivery point, discharge shall be completed within 1.5 hours, or before 250 revolutions of the drum or blades, whichever comes first, after the introduction of the cement to the aggregates. Under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 30°C, or above, a time less than 1.5 hours may be required.

- When non-agitating hauling equipment is used for transporting concrete to the delivery point, discharge shall be completed within one hour after the addition of the cement to the aggregates. Under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 30°C, or above, the time between the introduction of cement to the aggregates and discharge shall not exceed 45 minutes.

- Each load of concrete delivered at the job site shall be accompanied by a weight certificate showing the mix identification number, non-repeating load number, date and time at which the materials were batched, the total amount of water added to the load and for transit-mixed concrete, the reading of the revolution counter at the time the truck mixer is charged with cement. This weight certificate shall also show the actual scale masses (kilograms) for the ingredients batched. Theoretical or target batch masses shall not be used as a substitute for actual scale masses.

- Weight certificates shall be provided in printed form, or if approved by the Engineer, the data may be submitted in electronic media. Electronic media shall be presented in a tab-delimited format on 90 mm diskette with a capacity of at least 1.4 megabytes. Captured data, for the ingredients represented by each batch shall be LFCR (one line, separate record) with allowances for sufficient fields to satisfy the amount of data required by these specifications.

- The Contractor may furnish a weight certificate that is accompanied by a separate certificate which lists the actual batch masses or measurements for a load of concrete provided that both certificates are 1) imprinted with the same non-repeating load number that is unique to the contract and 2) delivered to the job site with the load.

- Weight certificates furnished by the Contractor shall conform to the provisions in Section 9-1.01, "Measurement of Quantities," of the Standard Specifications.

At the Contractor's option, retarding admixtures, conforming to ASTM Designation C 494, Type B, may be used to extend the setting times of machine mixed concrete. If the Contractor proposes use of retarding admixtures to allow changing the discharge times listed in the previous paragraphs, pre-qualification tests similar to those required for concrete for cast-in-drilled-hole piling, as specified elsewhere in these special provisions, shall be utilized to pre-qualify the retarding admixture. Retarding admixtures shall have no detrimental effect on the ultimate material properties of the concrete as proven and documented by testing.

Section 90-6.05, "Hand-Mixing," of the Standard Specifications is amended to read:

90-6.05 HAND-MIXING

- Hand-mixed concrete shall be made in batches not more than one-fourth cubic meter and shall be mixed on a watertight, level platform. The proper amount of coarse aggregate shall be measured in measuring boxes and spread on the platform and the fine aggregate shall be spread on this layer, the 2 layers being not more than 0.3 meters in total depth. On this mixture shall be spread the dry cement and mineral admixture and the whole mass turned no fewer than 2 times dry; then sufficient clean water shall be added, evenly distributed, and the whole mass again turned no fewer than 3 times, not including placing in the carriers or forms.

The table in the first paragraph in Section 90-6.06, "Amount of Water and Penetration," of the Standard Specifications is replaced with the following table:

Type of Work	Nominal Penetration (mm)	Maximum Penetration (mm)
Concrete pavement	0-25	40
Non-reinforced concrete facilities	0-35	50
Reinforced concrete structures:		
Sections over 300 mm thick	0-35	65
Sections 300 mm thick or less	0-50	75
Concrete placed under water	75-100	115
Cast-in-place concrete piles	65-90	100

The first paragraph following the table of penetration ranges in Section 90-6.06, "Amount of Water and Penetration," of the Standard Specifications is amended to read:

- The amount of free water used in concrete shall not exceed 183 kg/m³, plus 20 kg for each required 100 kg of cementitious material in excess of 325 kg/m³.

The fourth paragraph in Section 90-6.06, "Amount of Water and Penetration," of the Standard Specifications is amended to read:

- Where there are adverse or difficult conditions which affect the placing of concrete, the above specified penetration and free water content limitations may be exceeded providing the Contractor is granted permission by the Engineer in writing to increase the cementitious material content per cubic meter of concrete. The increase in water and cementitious material shall be at a ratio not to exceed 30 kg of water per added 100 kg of cementitious material per cubic meter. The cost of additional cementitious material and water added under these conditions shall be at the Contractor's expense and no additional compensation will be allowed therefor.

Section 90-9.01, "General," of the Standard Specifications is amended to read:

90-9.01 GENERAL

- Concrete compressive strength requirements consist of a minimum strength which must be attained before various loads or stresses are applied to the concrete and, for concrete designated by strength, a minimum strength at the age of 28 days or at the age otherwise allowed in Section 90-1.01, "Description." The various strengths required are specified in these specifications or are shown on the plans.
- The compressive strength of concrete will be determined from test cylinders which have been fabricated from concrete sampled in conformance with California Test 539. Test cylinders will be molded and initial field cured in conformance with California Test 540. Test cylinders will be cured and tested after receipt at the testing laboratory in conformance with California Test 521. A strength test shall consist of the average strength of 2 cylinders fabricated from material taken from a single load of concrete, except that, if any cylinder should show evidence of improper sampling, molding, or testing, that cylinder shall be discarded and the strength test shall consist of the strength of the remaining cylinder.
- When concrete compressive strength is specified as a prerequisite to applying loads or stresses to a concrete structure or member, test cylinders for other than steam cured concrete will be cured in conformance with Method 1 of California Test 540. The compressive strength of concrete determined for these purposes will be evaluated on the basis of individual tests.
- When concrete is designated by 28-day compressive strength rather than by cementitious material content, the concrete strength to be used as a basis for acceptance of other than steam cured concrete will be determined from cylinders cured in conformance with Method 1 of California Test 540. If the result of a single compressive strength test at the maximum age specified or allowed is below the specified strength but is 95 percent or more of the specified strength, the Contractor shall, at the Contractor's expense, make corrective changes, subject to approval by the Engineer, in the mix proportions or in the concrete fabrication procedures, before placing additional concrete, and shall pay to the State \$14 for each in-place cubic meter of concrete represented by the deficient test. If the result of a single compressive strength test at the maximum age specified or allowed is below 95 percent of the specified strength, but is 85 percent or more of the specified strength, the Contractor shall make the corrective changes specified above, and shall pay to the State \$20 for each in place cubic meter of concrete represented by the deficient test. In addition, such corrective changes shall be made when the compressive strength of concrete tested at 7 days indicates, in the judgment of the Engineer, that the concrete will not attain the required compressive strength at the maximum age specified or allowed. Concrete represented by a single test which indicates a compressive strength of less than 85 percent of the specified 28-day compressive strength will be rejected in conformance with the provisions in Section 6-1.04, "Defective Materials."

- If the test result indicates that the compressive strength at the maximum curing age specified or allowed is below the specified strength, but 85 percent or more of the specified strength, payments to the State as required above shall be made, unless the Contractor, at the Contractor's expense, obtains and submits evidence acceptable to the Engineer that the strength of the concrete placed in the work meets or exceeds the specified 28-day compressive strength. If the test result indicates a compressive strength at the maximum curing age specified or allowed below 85 percent, the concrete represented by that test will be rejected, unless the Contractor, at the Contractor's expense, obtains and submits evidence acceptable to the Engineer that the strength and quality of the concrete placed in the work are acceptable. If the evidence consists of tests made on cores taken from the work, the cores shall be obtained and tested in conformance with the requirements in ASTM Designation: C 42. Acceptance of rejected concrete based on tests of cores will be in accordance with ACI 318 Section 5.6.4.4.

- No single compressive strength test shall represent more than 250 cubic meters.

- When a precast concrete member is steam cured, the compressive strength of the concrete will be determined from test cylinders which have been handled and stored in conformance with Method 3 of California Test 540. The compressive strength of steam cured concrete will be evaluated on the basis of individual tests representing specific portions of production. When the concrete is designated by 28-day compressive strength rather than by cementitious material content, the concrete shall be considered to be acceptable whenever its compressive strength reaches the specified 28-day compressive strength provided that strength is reached in not more than the maximum number of days specified or allowed after the member is cast.

- If concrete is specified by compressive strength, then materials, mix proportions, mixing equipment, and procedures proposed for use shall be prequalified prior to placement of the concrete. Prequalification shall be accomplished by the submission of acceptable certified test data or trial batch reports by the Contractor. Prequalification data shall be based on the use of materials, mix proportions, mixing equipment, procedures, and size of batch proposed for use in the work.

- Certified test data, in order to be acceptable, must indicate that not less than 90 percent of at least 20 consecutive tests exceed the specified strength at the maximum number of cure days specified or allowed, and none of those tests are less than 95 percent of specified strength. Strength tests included in the data shall be the most recent tests made on concrete of the proposed mix design and all shall have been made within one year of the proposed use of the concrete.

- Trial batch test reports, in order to be acceptable, must indicate that the average compressive strength of 5 consecutive concrete cylinders, taken from a single batch, at not more than 28 days (or the maximum age allowed) after molding shall be at least 4 MPa greater than the specified 28-day compressive strength, (for concrete shown on the plans with a 28-day compressive strength of 35Mpa or less), or at least 10 MPa greater than the specified 28-day compressive strength (for concrete shown on the plans with a 28-day compressive strength of greater than 35Mpa), and no individual cylinder shall have a strength less than the specified strength at the maximum age specified or allowed. Data contained in the report shall be from trial batches which were produced within one year of the proposed use of specified strength concrete in the project. Whenever air-entrainment is required, the air content of trial batches shall be equal to or greater than the air content specified for the concrete without reduction due to tolerances.

- Tests shall be performed in conformance with either the appropriate California Test methods or the comparable ASTM test methods. Equipment employed in testing shall be in good condition and shall be properly calibrated. If the tests are performed during the life of the contract, the Engineer shall be notified sufficiently in advance of performing the tests in order to witness the test procedures.

- The certified test data and trial batch test reports shall include the following information:

- A. Date of mixing.
- B. Mixing equipment and procedures used.
- C. The size of batch in cubic meters and the mass, type and source of ingredients used.
- D. Penetration of the concrete.
- E. The air content of the concrete if an air-entraining admixture is used.
- F. The age at time of testing and strength of concrete cylinders tested.

- Certified test data and trial batch test reports shall be signed by an official of the firm which performed the tests.

- When approved by the Engineer, concrete from trial batches may be used in the work at locations where concrete of a lower quality is required and the concrete will be paid for as the type or class of concrete required at that location.

- After materials, mix proportions, mixing equipment, and procedures for concrete have been prequalified for use, additional prequalification by testing of trial batches will be required prior to making changes which, in the judgment of the Engineer, could result in a lowering of the strength of the concrete below that specified.

- The Contractor's attention is directed to the time required to test trial batches. The Contractor shall be responsible for production of trial batches at a sufficiently early date so that the progress of the work is not delayed.

Section 90-10.02A, "Portland Cement," of the Standard Specifications is renamed "Cementitious Material" and is amended to read:

90-10.02A CEMENTITIOUS MATERIAL

- Cementitious material shall conform to the provisions in Section 90-1.01, "Description." Compressive strength requirements consist of a minimum strength which must be attained before various loads or stresses are applied to the concrete and, for concrete designated by strength, a minimum strength at the age of 28 days or at the age otherwise allowed in Section 90-1.01, "Description." The various strengths required are specified in these specifications or are shown on the plans.

The fifth paragraph in Section 90-10.02B, "Aggregate," of the Standard Specifications is deleted.
Section 90-10.03, "Production," of the Standard Specifications is amended to read:

90-10.03 PRODUCTION

- Cementitious material, water, aggregate, and admixtures shall be stored, proportioned, mixed, transported, and discharged in conformance with recognized standards of good practice, which will result in concrete that is thoroughly and uniformly mixed, which is suitable for the use intended, and which conforms to provisions specified herein. Recognized standards of good practice are outlined in various industry publications such as those issued by American Concrete Institute, AASHTO, or California Department of Transportation.

- The cementitious material content of minor concrete shall conform to the provisions in Section 90-1.01, "Description."

- The amount of water used shall result in a consistency of concrete conforming to the provisions in Section 90-6.06, "Amount of Water and Penetration." Additional mixing water shall not be incorporated into the concrete during hauling or after arrival at the delivery point, unless authorized by the Engineer.

- Discharge of ready-mixed concrete from the transporting vehicle shall be made while the concrete is still plastic and before stiffening occurs. An elapsed time of 1.5 hours (one hour in non-agitating hauling equipment), or more than 250 revolutions of the drum or blades, after the introduction of the cementitious material to the aggregates, or a temperature of concrete of more than 32°C will be considered as conditions contributing to the quick stiffening of concrete. The Contractor shall take whatever action is necessary to eliminate quick stiffening, except that the addition of water will not be permitted.

- The required mixing time in stationary mixers shall be not less than 50 seconds or more than 5 minutes.

- The minimum required revolutions at mixing speed for transit-mixed concrete shall be not less than that recommended by the mixer manufacturer, and shall be increased, if necessary, to produce thoroughly and uniformly mixed concrete.

- Each load of ready-mixed concrete shall be accompanied by a weight certificate which shall be delivered to the Engineer at the discharge location of the concrete, unless otherwise directed by the Engineer. The weight certificate shall be clearly marked with the date and time of day when the load left the batching plant and, if hauled in truck mixers or agitators, the time the mixing cycle started.

- A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," shall be furnished to the Engineer, prior to placing minor concrete from a source not previously used on the contract, stating that minor concrete to be furnished meets contract requirements, including minimum cementitious material content specified.

The third and fourth paragraphs in Section 90-11.02, "Payment," of the Standard Specifications are amended to read:

- Should the Engineer order the Contractor to incorporate admixtures into the concrete when their use is not required by these specifications or the special provisions, furnishing the admixtures and adding them to the concrete will be paid for as extra work as provided in Section 4-1.03D.

- Should the Contractor use admixtures in conformance with the provisions in Section 90-4.05, "Optional Use of Chemical Admixtures," or Section 90-4.07, "Optional Use of Air-entraining Admixtures," or should the Contractor request and obtain permission to use other admixtures for the Contractor's benefit, the Contractor shall furnish those admixtures and incorporate them in the concrete at the Contractor's expense and no additional compensation will be allowed therefor.

If multiple admixtures are used in any concrete mix on this project, they shall be proven compatible for use in the same mix. That is, the required minimum specified material properties shall be achieved, and there shall be no detrimental effect on the long term durability, corrosion resistance, permeability or abrasion resistance of the concrete. Documentation for multiple admixture compatibility shall be submitted in the form of a list of past projects and mix designs where the admixtures have been used together, or by testing performed by the Contractor.

The Contractor's attention is directed to "Lightweight Concrete" and to "Mass Concrete" elsewhere in these special provisions.

8-2.02 CEMENT AND WATER CONTENT

The amount of free water used in concrete for deck slabs of bridges and structure approach slabs shall not exceed 180 kg/m^3 , plus 20 kg for each required 100 kg of cementitious material in excess of 400 kg/m^3 .

The temperature of mixed concrete for deck slabs of bridges, immediately before placing, shall be not less than 10°C nor more than 27°C . Aggregates and water shall be heated or cooled as necessary to produce concrete within these temperature limits. Neither aggregates nor mixing water shall be heated to exceed 65°C . If ice is used to cool the concrete, discharge of the mixer will not be permitted until all ice is melted. The Contractor's attention is directed to "Lightweight Concrete" and "Mass Concrete" elsewhere in these special provisions.

8-2.03 PIER AND FOOTING CONCRETE REQUIREMENTS

The ratio of water to cementitious materials at all piers and footing concrete shall not exceed 0.4.

The Contractor's attention is directed to the requirements for "Mass Concrete" elsewhere in these special provisions.

SECTION 8-3. WELDING

8-3.01 WELDING ELECTRODES

Flux core welding electrodes conforming to the requirements of AWS A5.20 E6XT-4 or E7XT-4 shall not be used to perform any type of welding for this project.

8-3.02 WELDING QUALITY CONTROL

Welding quality control shall conform to the requirements in the AWS welding codes, the Standard Specifications, and these special provisions.

Welding quality control shall apply when any work is welded in conformance with the provisions in Section 49, "Piling," Section 52, "Reinforcement," Section 55, "Steel Structures," Section 56-1, "Overhead Sign Structures," Section 75-1.035, "Bridge Joint Restrainer Units," or Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications.

In addition, welding quality control shall apply when welding is performed for the following work:

- A. PTFE Spherical Bearings
- B. Hinge C and D Bearings
- C. Joint Seal Assemblies
- D. Miscellaneous Metal (Bridge, Maintenance Access, Moveable Inspection Platforms)
- E. Tubular Handrailing

Wherever reference is made to the following AWS welding codes in the Standard Specifications, on the plans or in these special provisions, the year of adoption for these codes shall be as listed:

AWS Code	Year of Adoption
D1.1	2000
D1.4	1998
D1.5	1996
D1.5 (metric only)	1996
D1.6	1998

All requirements of the AWS welding codes shall apply unless specified otherwise in the Standard Specifications, on the plans or in these special provisions. Wherever the abbreviation AWS is used, it shall be equivalent to the abbreviations ANSI/AWS or ANSI/AASHTO/AWS.

The welding of all fracture critical members (FCMs) shall conform to the Fracture Control Plan (FCP), in Section 12 in AWS D1.5 and herein. The provisions of the FCP shall be clearly indicated in the Quality Control Plan (QCP), or in a separate FCP document, including the specification of all alternatives or other variables permitted in D1.5, Section 12 and herein. No welding shall be performed on any FCM until the QCP (or QCP and FCP) are submitted, reviewed and approved by the Engineer.

The Contractor shall designate in writing a welding Quality Control Manager (QCM). The QCM shall be responsible directly to the Contractor for the quality of welding, including materials and workmanship, performed by the Contractor and all subcontractors.

The QCM shall be the sole individual responsible to the Contractor for submitting, receiving, and approving all correspondence, required submittals, and reports to and from the Engineer.

The QCM shall not be employed or compensated by any subcontractor, or by other persons or entities hired by subcontractors, who will provide other services or materials for the project. The QCM shall not be employed or compensated by weld testing firms to be used in the work. The QCM may be an employee of the Contractor. The QCM shall be currently certified as AWS Certified Welding Inspectors (CWI) in conformance with the requirements in AWS QC1, "Standard and Guide for Qualification of Welding Inspectors."

Welding inspection personnel or nondestructive testing (NDT) firms to be used in the work shall not be employed or compensated by any subcontractor, or by other persons or entities hired by subcontractors, who will provide other services or materials for the project, except for the following conditions:

- A. The welding is performed at a permanent fabrication facility which is certified under the AISC Quality Certification Program, Category Cbr, Major Steel Bridges.
- B. The welding is performed at a permanent fabrication facility which is certified under the AISC Quality Certification Program, Category Sbd, Conventional Steel Building Structures. This condition shall apply only for work welded in conformance with the provisions in Section 56-1, "Overhead Sign Structures" or Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications.

Prior to performing ultrasonic NDT on field welds, the Contractor's welding inspection personnel shall have passed Caltrans' Ultrasonic Test. Field welding is defined as welding performed after the certificate of compliance has been furnished to the Engineer by the fabricator or manufacturer for said materials. Information regarding the Caltrans Ultrasonic (titled "Notification of California Department of Transportation Qualification Requirement for Ultrasonic Testing Personnel") is included in the "Information Handout," available to the Contractor as provided for in Section 2-1.03, "Examination of Plans, Specifications, Contract and Site of Work," of the Standard Specifications. This test includes both written and practical examinations.

For welding performed at such certified facilities, the inspection personnel or NDT firms may be employed or compensated by the fabrication facility performing the welding.

Prior to submitting the Welding Quality Control Plan (WQCP) required herein, a pre-welding meeting between the Engineer, Contractor and any welding subcontractors or entities hired by these subcontractors to be used in the work, shall be held to discuss the requirements for the WQCP. This meeting shall be held in the Resident Engineer's Office, or at another location, as approved by the Engineer.

Prior to performing any welding, the Contractor shall submit to the Engineer, in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications, 3 copies of a separate WQCP for each item of work for which welding is to be performed. The QCP shall be reviewed and signed by the QCM prior to submittal to the Engineer. As a minimum, each WQCP shall include the following:

- A. The name of the welding firm and the NDT firm to be used;
- B. A manual prepared by the NDT firm that shall include equipment, testing procedures, code of safe practices, the Written Practice of the NDT firm, and the names, qualifications and documentation of certifications for all personnel to be used;
- C. The name of the QCM and the names, qualifications and documentation of certifications for all Quality Control (QC) Inspectors and Assistant Quality Control Inspectors to be used;
- D. An organizational chart showing all QC personnel and their assigned QC responsibilities;
- E. The methods and frequencies for performing all required quality control procedures, including QC inspection forms to be used, as required by the specifications including:
 - 1. all visual inspections;
 - 2. all NDT including NDT reports, radiographic geometry, penetrometer and shim selection, film quality, film processing, radiograph identification and marking system, and film interpretation and reports; and
 - 3. calibration procedures and calibration frequency for all NDT equipment;
- F. A system for the identification and tracking of all welds, NDT and any required repairs, and a procedure for the reinspection of any repaired welds. The system shall have provisions for 1) permanently identifying each weld and the person who performed the weld, 2) placing all required identification and tracking information on each radiograph and NDT report and 3) a method of reporting nonconforming welds to the Engineer; 4) film shall be identified by lead numbers only; etching, flashing, or writing in identifications of any type will not be permitted 5) each piece of film identification information shall be legible and shall include, as a minimum, the following information: Contractor's name, date, name of nondestructive testing firm, initials of radiographer, contract number,

part number, and weld number 6) the letter "R" and repair number shall be placed directly after the weld number to designate a radiograph of a repaired weld;

- G. Standard procedures for performing noncritical repair welds. Noncritical repair welds are defined as welds to deposit additional weld beads or layers to compensate for insufficient weld size and to fill limited excavations that were performed to remove unacceptable edge or surface discontinuities, overlap or undercut. The depth of these excavations shall not exceed 65 percent of the specified weld size;
- H. The welding procedure specification (WPS), including documentation of all supporting Procedure Qualification Record (PQR) tests performed, and the name of the testing laboratory who performed the tests, to verify the acceptability of the WPS. All WPS's shall be prepared and signed by a CWI and then submitted directly to the QCM for review and signature prior to submittal to the Engineer. The submitted WPS shall be within the allowable period of effectiveness;
- I. Documentation of all certifications for welders for each weld process and position that will be used. Certifications shall list the electrodes used, test position, base metal and thickness, tests performed, and the witnessing authority. All certifications shall be within the allowable period of effectiveness; or provide evidence that the welder(s) have not exceeded the 6 month requirement per AWS and
- J. One copy each of all AWS welding codes and the FCP which are applicable to the welding to be performed. These codes and the FCP shall become the permanent property of the Department.
- K. Example forms to be used for Certificates of Compliance, daily production logs, and inspection log of welds for use by QC inspector, action plan for reporting non-conforming welds and daily reports.
- L. Documentation for UT technicians that have passed the Caltrans Qualification Requirements for Ultrasonic Testing.

The Engineer shall have 10 working days to review the WQCP submittal after a complete plan has been received. If a returned corrected QCP is resubmitted for review by the Engineer, the Engineer shall have an additional 10 working days to review the QCP submittal. No welding shall be performed until the WQCP is approved in writing by the Engineer. Should the Engineer fail to complete the review within this time allowance and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in reviewing the WQCP, the delay will be considered a right of way delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

An amended WQCP or addendum shall be submitted to, and approved in writing by the Engineer, for any proposed revisions to the approved WQCP. The amended WQCP shall be reviewed and signed by the QCM prior to submittal to the Engineer. An amended WQCP or addendum will be required for any revisions to the WQCP, including but not limited to a revised WPS, additional welders, changes in NDT firms or procedures, QC or NDT personnel, or updated systems for tracking and identifying welds. The Engineer shall have 7 working days to complete the review of the amended WQCP or addendum. Work that is affected by any of the proposed revisions shall not be performed until the amended WQCP or addendum has been approved. Should the Engineer fail to complete the review within this time allowance and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in reviewing the amended WQCP or addendum, the delay will be considered a right of way delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

After final approval of the WQCP, amended WQCP, or addendum, the Contractor shall submit 7 copies to the Engineer of each of these approved documents.

It is expressly understood that the Engineer's approval of the Contractor's WQCP shall not relieve the Contractor of any responsibility under the contract for the successful completion of the work in conformity with the requirements of the plans and specifications. The Engineer's approval shall not constitute a waiver of any of the requirements of the plans and specifications nor relieve the Contractor of any obligation thereunder, and defective work, materials and equipment may be rejected notwithstanding approval of the WQCP.

A daily production log for welding shall be kept by the QCM for each day that welding is performed. The log shall clearly indicate the locations of all welding, and shall include the welders' names, amount of welding performed, any problems or deficiencies discovered, and any testing or repair work performed, at each location. The daily report from each Quality Control Inspector shall also be included in or with the log.

The following items shall be included in a Welding Report that is to be submitted to the Engineer within 48 hours following the completion of any welding inspection:

- A. Reports of all visual weld inspections and NDT;
- B. Radiographs and radiographic reports, and other required NDT reports;
- C. Documentation that the Contractor has evaluated all radiographs and other nondestructive tests, corrected all rejectable deficiencies, and all repaired welds have been reexamined by the required NDT and found acceptable; and
- D. Daily production log.

All radiographic envelopes shall have clearly written on the outside of the envelope the following information: name of the QCM, name of the nondestructive testing firm, name of the radiographer, date, contract number, complete part description, and all included weld numbers or a report number, as detailed in the WQCP. In addition, all innerleaves shall have clearly written on them the part description and all included weld numbers, as detailed in the WQCP.

All reports regarding visual weld inspection and NDT, including radiographs, shall be signed by both the NDT technician and the person that performed the review, and then submitted directly to the QCM for review and signature prior to submittal to the Engineer. Corresponding names and titles shall be clearly printed or typewritten next to all signatures.

The Engineer will review the Welding Report to determine if the Contractor is in conformance with the WQCP. Except for steel piling the Engineer shall be allowed 7 days to review the report and respond in writing after a complete Welding Report has been received. The review time for steel piling shall be as specified in "Piling" of these special provisions. Prior to receiving notification from the Engineer of the Contractor's conformance with the WQCP, the Contractor may encase in concrete or cover any welds for which a Welding Report has been submitted. However, should the Contractor elect to encase or cover those welds prior to receiving notification from the Engineer, it is expressly understood that the Contractor shall not be relieved of the responsibility for incorporating material in the work that conforms to the requirements of the plans and specifications. Any material not conforming to these requirements will be subject to rejection. Should the Contractor elect to wait to encase or cover any welds pending notification by the Engineer, and should the Engineer fail to complete the review and provide notification within this time allowance, and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in notification, the delay will be considered a right of way delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

Sections 6.1.2 through 6.1.4.3 of AWS D 1.1, Sections 7.1.1 and 7.1.2 of AWS D 1.4, and Sections 6.1.1.1 through 6.1.3.3 of AWS D 1.5 are replaced with the following:

Quality Control (QC) shall be the responsibility of the Contractor. As a minimum, the Contractor shall perform inspection and testing prior to welding, during welding and after welding as specified in this section and additionally as necessary to ensure that materials and workmanship conform to the requirements of the contract documents.

The Quality Control (QC) Inspector shall be the duly designated person who performs inspection, testing, and quality matters for all welding.

Quality Assurance (QA) is the prerogative of the Engineer and is independent of QC. The QA Inspector is the duly designated person who acts for and on behalf of the Engineer.

All QC Inspectors shall be responsible for quality control acceptance or rejection of materials and workmanship, and shall be currently certified as AWS Certified Welding Inspectors (CWI) in conformance with the requirements in AWS QC1, "Standard and Guide for Qualification of Welding Inspectors."

The QC Inspector may be assisted by an Assistant QC Inspector provided that this individual is currently certified as an AWS Certified Associate Welding Inspector (CAWI) in conformance with the requirements in AWS QC1, "Standard and Guide for Qualification of Welding Inspectors," or has equivalent qualifications as determined by the Engineer. The QC Inspector shall monitor the Assistant QC Inspector's work, and shall be responsible for signing all reports.

When the term "Inspector" is used without further qualification, it shall refer to the QC Inspector.

Section 6.14.6, "Personnel Qualification," of AWS D 1.1, Section 7.8, "Personnel Qualification," of AWS D 1.4, and Section 6.1.3.4, "Personnel Qualification," of AWS D 1.5 are replaced with the following:

Personnel performing NDT shall be qualified and certified in accordance with the requirements in the current edition of the American Society for Nondestructive Testing (ASNT) Recommended Practice No. SNT-TC-1A and the Written Practice of the NDT firm. In addition, a Level III must be certified as a Level II when performing NDT. The Written Practice of the NDT firm shall meet or exceed the requirements of the current edition of the ASNT Recommended Practice No. SNT-TC-1A. Only individuals who are 1) qualified for NDT Level II, or 2) Level III technicians who have been directly certified by the ASNT and are authorized to perform the work of Level II technicians, shall perform NDT, review the results, and prepare the written reports.

Section 6.5.4, "Scope of Examination," of AWS D 1.1 and Section 7.5.4 of AWS D 1.4 are replaced with the following:

The QC Inspector shall inspect and approve the joint preparation, assembly practice, welding techniques, and performance of each welder, welding operator, and tack welder to make certain that the applicable requirements of this code and the approved WPS are met.

Prior to performing ultrasonic type NDT, personnel performing ultrasonic NDT will be required to verify their qualifications by both written and practical examinations. Information regarding these examinations included as "Information Handout," available to the Contractor as provided for in Section 2-1.03, "Examination of Plans, Specifications, Contract, and Site of Work," of the Standard Specifications.

Section 6.5.4 of AWS D 1.5 is replaced with the following:

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The QC Inspector shall inspect and approve the joint preparation, assembly practice, welding techniques, and performance of each welder, welding operator, and tack welder to make certain that the applicable requirements of this code and the approved WPS are met. The QC Inspector shall examine the work to make certain that it meets the requirements of section 3 and 9.21. The size and contour of welds shall be measured using suitable gages. Visual inspection for cracks in welds and base metal, and for other discontinuities should be aided by strong light magnifiers, or such other devices as may be helpful. Acceptance criteria different from those specified in this code may be used when approved by the Engineer.

The Engineer shall have the authority to verify the qualifications or certifications of any welder, Quality Control Inspector, or NDT personnel to specified levels by retests or other means.

A sufficient number of QC Inspectors shall be provided to ensure continuous inspection when any welding is being performed. Continuous inspection, as a minimum, shall include (1) having QC Inspectors continually present on all shifts when any welding is being performed, or (2) having a QC Inspector within such close proximity of all welding operations that inspections by the QC Inspector of each operation, at each welding location, shall not lapse for a period exceeding 30 minutes.

Inspection and approval of the joint preparation, assembly practice, welding techniques, and performance of each welder, welding operator, and tack welder shall be documented by the QC Inspector on a daily basis for each day that welding is performed.

The QC Inspector shall provide reports to the QCM on a daily basis for each day that welding is performed.

Except for noncritical weld repairs, base metal repairs, or any other type of repairs submitted in the WQCP, the Engineer shall be notified immediately in writing when any welding problems or deficiencies are discovered and also of the proposed repair procedures to correct them. The Engineer shall have 5 working days to review these procedures. No remedial work shall begin until the repair procedures are approved in writing by the Engineer. Should the Engineer fail to complete the review within this time allowance and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in reviewing the proposed repair procedures, the delay will be considered a right of way delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

When joint details that are not prequalified by the applicable AWS codes are proposed for use in the work, all welders using these details shall perform a qualification test plate using the approved WPS variables and the joint detail to be used in production. The test plate shall be the maximum thickness to be used in production. The test plate shall be mechanically or radiographically tested as directed by the Engineer. Mechanical and radiographic testing and acceptance criteria shall be as specified in the applicable AWS codes.

The period of effectiveness for a welder's or welding operator's qualification, without re-qualification by testing, shall be a maximum of 3 years for the same weld process, and welding position. A valid qualification at the beginning of work on a contract will be acceptable for the entire period of the contract, as long as the welder's work remains satisfactory.

All qualification tests for welders, welding operators, and WPSs used in welding operations shall be witnessed by the Engineer.

Section 6.6.5, "Nonspecified Nondestructive Testing Other Than Visual," of AWS D 1.1, Section 6.6.5 of AWS D 1.4 and Section 6.6.5 of AWS D 1.5 shall not apply.

For any welding, the Engineer may direct the Contractor to perform NDT that is in addition to the visual inspection or NDT specified in the AWS welding codes, in the Standard Specifications or in these special provisions. Additional NDT required by the Engineer, will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications. Should any welding deficiencies be discovered by this additional NDT, the cost of the testing will not be paid for as extra work and shall be at the Contractor's expense.

All required repair work to correct welding deficiencies, whether discovered by the required visual inspection or NDT, or by additional NDT directed by the Engineer, and any associated delays or expenses caused to the Contractor by performing these repairs, shall be at the Contractor's expense.

At the completion of all welding, the QCM shall sign and furnish to the Engineer, a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for each item of work for which welding was performed. The certificate shall state that all of the materials and workmanship incorporated in the work, and all required tests and inspections of this work, have been performed in conformance with the details shown on the plans and the provisions of the Standard Specifications and these special provisions.

Full compensation for conforming to of the requirements of this section shall be considered as included in the contract prices paid for the various items of work involved and no additional compensation will be allowed therefor.

SECTION 9. DESCRIPTION OF BRIDGE WORK

The bridge work, in general, consists of constructing the new Benicia Martinez Bridge and Overhead, Bridge No. 28-0153R, a four frame, 2265.90 meter long cast-in-place post-tensioned concrete bridge spanning over the Carquinez straits and

supported on cast-in-drilled-hole concrete piling with and without permanent steel casing. Portions of the bridge will be constructed using segmental construction with the remainder being constructed using conventional falsework.

SECTION 10. CONSTRUCTION DETAILS

SECTION 10-1. GENERAL

10-1.01 ORDER OF WORK

Order of work shall conform to the provisions in Section 5-1.05, "Order of Work," of the Standard Specifications and these special provisions.

Attention is directed to Section 5-1.23, "Environmental Work Restrictions," of these special provisions.

The first order of work shall be to place the order for the traffic signal equipment, electrical facilities, conduit layout, grounding layout and marine navigational aids systems. The Engineer shall be furnished a statement from the vendor that the order for the said systems has been received and accepted by the vendor.

Attention is directed to Section 10-4.01, "General," of these special provisions regarding the order of work concerning electrical work for the seismic monitoring system and the health monitoring system.

The uppermost layer of new pavement shall not be placed until all underlying conduits and loop detectors have been installed.

Prior to commencement of the traffic signal functional test at any location, all items of work related to signal control shall be completed and all roadside signs, pavement delineation, and pavement markings shall be in place at that location.

No above ground electrical work shall be performed on any system within the project site until all Contractor-furnished electrical materials for that individual system have been tested and delivered to Contractor.

Attention is directed to "Miscellaneous Concrete Construction" of these special provisions regarding constructing a 600 mm by 600 mm test panel prior to constructing curb ramps with detectable warning surfaces.

Attention is directed to "Segmentally Erected Superstructure" of these special provisions and to the stage construction sheets of the plans.

Attention is directed to "Progress Schedule (Critical Path)" of these special provisions regarding the submittal of a general time-scaled logic diagram within 10 days after approval of the contract. The diagram shall be submitted prior to performing any work that may be affected by any proposed deviations to the construction staging of the project.

The work shall be performed in conformance with the stages of construction shown on the plans, unless the staging is altered by an approved CRIP. Nonconflicting work in subsequent stages may proceed concurrently with work in preceding stages, provided satisfactory progress is maintained in the preceding stages of construction.

A first order of work shall be ordering the pipe for the 2.5 m Permanent Steel Casing.

Prior to constructing any production piles on this project the Contractor shall successfully complete the pile load test as detailed on the plans and as specified in these special provisions. After a successful pile load test, a first order of work shall be the construction of the middle pile of the southern side of the Pier 9 pile group. This pile shall successfully pass all acceptance tests, with concrete placed to the bottom of footing elevation, prior to proceeding with any other 2.5 m or 2.6 m cast-in-drilled-hole concrete piling on the project, including permanent steel casing installation.

If the Contractor elects to change the construction sequence from that shown on the plans, the Contractor shall complete work on Frame 1 on the same sequence as shown on the plans.

The submittal of the lightweight concrete quality control plan, mix design and lightweight concrete aggregate shall be a first order of work.

A first order of work shall be the submittal of sample 75 mm high strength prestressing rods for testing and certification.

A first order of work shall be the qualification of the Contractor's prestressing system in lightweight concrete in accordance with Section 50, "Prestressing Concrete," of the Standard Specifications and these special provisions.

The Contractor's attention is directed to the restrictions concerning construction of adjacent cast-in-drilled-hole concrete piling and installation of permanent or temporary casing elsewhere in these special provisions.

The steel plate girders at hinge C and D shall be installed after the steel box girders have been installed and the bearings locked into place.

The work defined as Phase II in Section "Seismic Monitoring Electrical System," elsewhere in these special provisions shall not begin until the completion of all conflicting work in this contract and as determined by the Engineer.

The Contractor shall not have more than one excavation open at a time between Abutment 1 and Pier 5, so that any disposal of contaminated groundwater is minimized.

The Contractor's attention is also directed to "Seismic Monitoring Electrical System" for installation of instruments within certain cast-in-drilled-hole concrete piles during construction of the piles.

Slurry cement-bentonite backfill at Pier 5 shall be placed in lifts and allowed to cure in accordance with these special provisions and such that the maximum wall pressure shown on the plans is not exceeded.

A first order of work shall be the ordering and fabrication of all materials required for the test pile. All work on the test pile shall be completed within 4 months of the award of this contract.

10-1.02 ENVIRONMENTALLY SENSITIVE AREA (GENERAL)

The Contractors attention is directed to the designated Environmentally Sensitive Area (ESA), shown on the plans. The exact location of the boundaries of environmentally sensitive area shall be established by the Engineer and clearly delineated by the placement of Temporary fence (Type ESA) as described in these special provisions.

Within the boundaries of an ESA, no project related activities shall take place. This specifically prohibits vehicle access, storage or transport of any materials, including hydrocarbon and lead contaminated material, or any other project related activities.

10-1.03 OVERHEAD

The Contractor will be compensated for overhead in accordance with these special provisions.

Attention is directed to "Force Account Payment" and "Progress Schedule (Critical Path)" of these special provisions.

Section 9-1.08, "Adjustment of Overhead Costs," of the Standard Specifications shall not apply.

Time related overhead shall consist of those overhead costs, including field and home office overhead, that are in proportion to the time required to complete the work. Time related overhead costs shall not include costs that are not related to time, including but not limited to mobilization, licenses, permits, and any other charges incurred only once during duration of the contract.

The contract lump sum price paid for time related overhead shall include full compensation for time related overhead incurred by the Contractor and by any joint venture partner, subcontractor, supplier or other party associated with the Contractor.

The contract lump sum price bid for time related overhead will be adjusted only as a result of suspensions and adjustments of time which revise the current date to complete all contract work (except the work defined as Phase II in Section 10-4.01, "Electrical Monitoring Systems," of the Special Provisions) and which are also any of the following:

- A. suspensions of work ordered in accordance with Section 8-1.05, "Temporary Suspension of Work," of the Standard Specifications, except:
 - 1. suspensions ordered due to the failure on the part of the Contractor to carry out orders given, or to perform any provision of the contract; and
 - 2. suspensions ordered due to unsuitable weather conditions;
- B. extensions of time granted by the State in accordance with the provisions of the fifth paragraph of Section 8-1.07, "Liquidated Damages," of the Standard Specifications; or
- C. reductions in contract time set forth in approved contract change orders, in accordance with Section 4-1.03, "Changes," of the Standard Specifications.

For each day that the number of calendar days bid to complete the contract (except the work defined as Phase II in Section 10-4.01, "Electrical Monitoring Systems," of the Special Provisions), in conformance with the provisions in Section 4, "Beginning Of Work, Time Of Completion And Liquidated Damages," of these special provisions, is adjusted due to suspensions or adjustments as specified above, the lump sum price for time related overhead will be adjusted by an amount equal to the contract lump sum price bid for time related overhead divided by the number of calendar days bid to complete the contract. The provisions in Sections 4-1.03B, "Increased or Decreased Quantities" and 4-1.03C, "Changes in Character of the Work," of the Standard Specifications, shall not apply to time related overhead.

For the purpose of making partial payments pursuant to Section 9-1.06, "Partial Payments," of the Standard Specifications, time related overhead to be paid in each monthly estimate will be based on the number of working days that occurred during that monthly estimate period. The amount earned per day for time related overhead shall be the lesser of the following amounts:

- A. the contract lump sum price for time related overhead, divided by the number of calendar days bid to complete the work (except the work defined as Phase II in Section 10-4.01, "Electrical Monitoring Systems"), in conformance with the provisions in Section 4, "Beginning Of Work, Time Of Completion And Liquidated Damages," of these special provisions; or
- B. fifteen percent of the original contract amount, divided by the number of calendar days bid to complete the work (except the work defined as Phase II in Section 10-4.01, "Electrical Monitoring Systems"), in conformance with the provisions in Section 4, "Beginning Of Work, Time Of Completion And Liquidated Damages," of these special provisions.

After acceptance of the contract pursuant to Section 7-1.17, "Acceptance of Contract," of the Standard Specifications, the amount, if any, of the contract lump sum price for time related overhead not yet paid will be included for payment in the first estimate made after acceptance of the contract in accordance with Section 9-1.07, "Payment after Acceptance," of the Standard Specifications.

Full compensation for all overhead costs, including overhead costs for increases in the quantity of contract items of work and overhead costs for work defined as Phase II in Section 10-4.01, "Electrical Monitoring Systems," of the special provisions; other than time related overhead paid for as specified above, and other than overhead costs included in the markups specified in "Force Account Payment" of these special provisions; shall be considered as included in the various items of work and no additional compensation will be allowed therefor.

10-1.04 MODIFY MONITORING WELLS

Modify monitoring wells shall consist of extending existing monitoring wells NA, 31, and 42 to an elevation at or above finished grade, as shown on the plans. The work shall include, but is not limited to, extension of existing steel pipe casing and PVC piping, backfilling the space between steel casing and PVC piping, construction of concrete pads at finished grade, and installation of metal frames and locking covers as shown on the plans. The Contractor shall perform all work in conformance with Contra Costa County regulations.

The contract lump sum price paid for modify monitoring wells shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in extending the existing monitoring wells, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.05 TEMPORARY DRAINAGE INLET PROTECTION

Temporary drainage inlet protection shall be installed, maintained and later removed as shown on the plans, as specified in these special provisions, and as directed by the Engineer.

Temporary drainage inlet protection shall be limited to those areas that are not adjacent to, nor drain toward, areas of active traffic.

The Contractor shall select the appropriate drainage inlet protection shown on the plans commensurate to the field condition around the drainage inlet. For all other drainage inlets within the project limits that do not conform to the details shown on the plans, the Contractor shall submit to the Engineer for approval, provisions for providing temporary drainage inlet protection.

Special attention shall be given to existing and new drainage inlets adjacent to traffic. The Engineer shall review the need for drainage inlet protection commensurate to each location. Any proposed drainage inlet protection in such cases shall be approved by the Engineer for safety related concerns.

Throughout the duration of the Contract, the Contractor shall be required to provide protection commensurate with the changing condition of the drainage inlet. It is recognized that the drainage inlet changes during the course of construction and the actual protection provided may require selecting the appropriate type or types of drainage inlet protection as it changes during the course of construction.

Some conditions may require combining materials outlined in the special provision to address conditions that cannot be accounted for at this time. The Contractor shall submit temporary drainage inlet protection drawings for such cases to the Engineer for approval prior to installation.

The Contractor shall use temporary drainage inlet protection as one of the various measures to prevent water pollution. The Storm Water Pollution Prevention Plan shall graphically show the use of temporary drainage inlet protection in relation to other water pollution control work specified elsewhere in these special provisions.

MATERIALS.—

Materials shall conform to the provisions in Section 20-2, "Materials," of the Standard Specifications and these special provisions.

- A. **SILT FENCE.**—Sedimentation control fabric for temporary silt fence shall be a prefabricated silt fence with a minimum woven polypropylene fabric width of 900 mm and a minimum tensile strength of 0.44-kN, conforming to ASTM Designation: D 4632.
- B. **ROCK BAG.**—Rock bag fabric shall be non-woven polypropylene, with a minimum unit weight of 250g/m². The fabric shall have a mullen burst strength of at least 2500 kPa, per ASTM Designation: D3786 and an ultraviolet (UV) stability exceeding 70 percent at 500 hours.

Rock bags shall have a length of 600 mm to 800 mm, width of 400 mm to 500 mm, thickness of 150 mm to 200 mm, and be capable of containing a weighted mass of 13 kg to 22 kg.

Rock bag fill material shall be non-cohesive gravel, free from deleterious material. Rock bags shall be filled and the opening secured such that rock shall not escape from the bag.

- C. **TEMPORARY FLEXIBLE DIKE.**—Temporary flexible dike fabric cover and skirt shall be a woven polypropylene fabric with a minimum tensile strength of 0.44-kN, conforming to ASTM Designation: D 4632. The prefabricated fabric shall be high visibility orange in color that is integral to the fabric; painting shall not be allowed. The fabric shall have an ultraviolet (UV) stability exceeding 70 percent.

Temporary flexible dike inner material shall be urethane foam and shall be shaped and dimensioned as shown on the plans.

Adhesive for temporary flexible dike shall be a solvent free rubber modified asphalt emulsion. The color of the emulsion shall be brown when wet and shall have a drying period of not more than 3 hours.

Anchoring nails or spikes for temporary flexible dike shall be a minimum of 25 mm in length and capable of penetrating concrete and asphalt surfaces.

- D. **EROSION CONTROL BLANKET.**—Erosion control blanket shall consist of straw and coconut or wood excelsior blanket secured in place with wire staples and shall conform to one of the following:

- E. **EXCELSIOR BLANKET.**—Excelsior blanket material shall consist of machine produced mats of curled wood excelsior with 80 percent of the fiber 150 mm or longer. The erosion control blanket shall be of consistent thickness and the wood fiber shall be evenly distributed over the entire area of the blanket. The top surface of the blanket shall be covered with an extruded plastic mesh. The blanket shall be smolder resistant without the use of chemical additives and shall be non-toxic and non-injurious to plant and animal life. Erosion control blanket shall be furnished in rolled strips, 1220 mm -2440 mm in width, and shall have an average mass of 0.5-kg/m^2 , ± 10 percent, at the time of manufacture.

- F. **STRAW AND COCONUT BLANKET.**—Straw and coconut blanket shall be machine produced mats of straw and coconut with a light weight netting on top. The straw and coconut shall be adhered to the netting with biodegradable thread or glue strip. The straw and coconut erosion control blanket shall be of consistent thickness with the straw and coconut evenly distributed over the entire area of the blanket. Straw and coconut erosion control blanket shall be furnished in rolled strips with a minimum width of 1.8 meters, minimum length of 20 meters (± 1 meter) and a minimum weight of 0.27-kg/m^2 .

- G. **STAPLES.**—Staples for erosion control blankets shall be made of 11-gage minimum steel wire and shall conform to the dimensions shown on the plans.

INSTALLATION AND MAINTENANCE

Temporary flexible dike consists of individual sections of dike installed in conjunction with one another adjacent to existing drainage inlets as shown on the plans. The spacing and angle of placement shall be in accordance with the table shown on the plans. Temporary flexible dike shall be installed flush against the sides of concrete or asphalt curbs, dikes and pavement with the inner material and fabric cover cut smoothly and evenly to provide a tight flush joint.

Temporary flexible dike and rock bag dike installed as part of temporary drainage inlet protection shall be maintained to provide for adequate sediment holding capacity. Sediment deposits shall be removed when the deposit reaches one-half of the temporary flexible dike height. Removed sediment shall be deposited within the project in such a way that it is not subject to erosion by wind or water, or as directed by the Engineer.

Temporary rock bag dike consisting of filled rock bags placed in multiple layers shall be installed as shown on the plans.

When no longer required for the purpose, as determined by the Engineer, temporary drainage inlet protection facilities shall be removed. Removed facilities shall become the property of the Contractor and shall be removed from the site of the work.

Temporary drainage inlet protection damaged due to storms or as a result of the Contractors operations shall be replaced by the Contractor at his expense.

MEASUREMENT AND PAYMENT

The quantity of temporary drainage inlet protection to be paid for will be determined from each drainage inlet protected conforming to the details shown on the plans. The protection is measured one time only and no additional measurement is recognized, and no additional compensation made, if it changes during the course of construction.

The contract unit price paid per temporary drainage inlet protection shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing temporary drainage inlet protection, complete in place, including excavation and backfill, all modifications occurring during the course of

construction, and maintenance and removal of temporary drainage inlet protection, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Temporary drainage inlet protection for protection at drainage inlets other than as shown on the project plans or directed by the Engineer, in accordance with the Contractor's Storm Water Pollution Prevention Plan (SWPPP), will not be measured as temporary drainage inlet protection. Payment for drainage inlet protection that is required as part of the SWPPP, but is not shown on the project plans, will be paid for as specified in "Water Pollution Control" elsewhere in these special provisions.

No adjustment of compensation will be made for any increase or decrease in the quantities of temporary drainage inlet protection required, regardless of the reason for the increase or decrease. The provisions in Section 4-1.03B, "Increased or Decreased Quantities," shall not apply to temporary drainage inlet protection.

10-1.06 WATER POLLUTION CONTROL

Water pollution control work shall conform to the provisions in Section 7-1.01G, "Water Pollution," of the Standard Specifications and these special provisions.

This project shall conform to the requirements of General Construction Activity Storm Water Permit No. CAS000002 and Caltrans Statewide Storm Water Permit No. CAS000003 issued by the State Water Resources Control Board. These permits, hereafter referred to as the "Permit," regulate storm water discharges associated with construction activities.

Water pollution control work shall conform to the requirements in the Construction Contractor's Guide and Specifications of the Caltrans Storm Water Quality Handbooks, dated April 1997, and addenda thereto issued up to, and including, the date of advertisement of the project, hereafter referred to as the "Handbook." Copies of the Handbook and the General Permit may be obtained from the Department of Transportation, Material Operations Branch, Publication Distribution Unit, 1900 Royal Oaks Drive, Sacramento, California 95815, Telephone: (916) 445-3520. In addition, a Conceptual Storm Water Pollution Prevention Plan, hereafter referred to as the "CSWPPP" has been prepared for this project by the Department. The CSWPPP shall be used as a reference tool for developing the contract specific Storm Water Pollution Prevention Plan. This document is being provided for informational purposes only and shall be revised to correspond to the projects staging and the Contractor's actual methods of construction.

Copies of the Handbook, CSWPPP, and the Permit are also available for review at 111 Grand Avenue, Oakland, California 94612-3731. Call the Toll Bridge Duty Senior, telephone number (510) 286-5549 to reserve a copy of the document at least 24 hours in advance.

The Contractor shall know and fully comply with the applicable provisions of the Handbook, Permit, and Federal, State, and local regulations that govern the Contractor's operations and storm water discharges from both the project site and areas of disturbance outside the project limits during construction. The Contractor shall maintain a copy of the Permit at the project site and shall make the Permit available during construction.

Unless arrangements for disturbance of areas outside the project limits are made by the Department and made part of the contract, it is expressly agreed that the Department assumes no responsibility whatsoever to the Contractor or property owner with respect to any arrangements made between the Contractor and property owner to allow disturbance of areas outside the project limits.

The Contractor shall be responsible for the costs and for liabilities imposed by law as a result of the Contractor's failure to comply with the provisions set forth in this section "Water Pollution Control", including but not limited to, compliance with the applicable provisions of the Handbook, Permit and Federal, State and local regulations. For the purposes of this paragraph, costs and liabilities include, but are not limited to, fines, penalties, and damages whether assessed against the State or the Contractor, including those levied under the Federal Clean Water Act and the State Porter Cologne Water Quality Act.

In addition to the remedies authorized by law, some of the money due the Contractor under the contract, as determined by the Department, may be retained by the State of California until disposition has been made of the costs and liabilities.

The retention of money due the Contractor shall be subject to the following:

- A. The Department will give the Contractor 30 days notice of the Department's intention to retain funds from partial payments which may become due to the Contractor prior to acceptance of the contract. Retention of funds from payments made after acceptance of the contract may be made without prior notice to the Contractor.
- B. No retention of additional amounts out of partial payments will be made if the amount to be retained does not exceed the amount being withheld from partial payments pursuant to Section 9-1.06, "Partial Payments," of the Standard Specifications.
- C. If the Department has retained funds and it is subsequently determined that the State is not subject to the costs and liabilities in connection with the matter for which the retention was made, the Department shall be liable for interest on the amount retained at the legal rate of interest for the period of the retention.

Conformance with the provisions of this section "Water Pollution Control" shall not relieve the Contractor from the Contractor's responsibilities, as provided in Section 7, "Legal Relations and Responsibilities," of the Standard Specifications.

At reasonable times and upon presentation of credentials and other documents as may be required by law, the Contractor shall allow authorized agents of the California Regional Water Quality Control Board, State Water Resources Control Board, United States Environmental Protection Agency and the local storm water management agency to:

- A. Enter upon the construction site and the Contractor's facilities pertinent to the work;
- B. Have access to and copy records that must be kept as specified in the Permit;
- C. Inspect the construction site and related soil stabilization practices and sediment control measures; and
- D. Sample or monitor for the purpose of ensuring compliance with the Permit.

The Contractor shall notify the Engineer immediately upon request from the regulatory agencies to enter, inspect, sample, monitor or otherwise access the project site or the Contractor's records.

STORM WATER POLLUTION PREVENTION PLAN PREPARATION, APPROVAL AND AMENDMENTS

As part of the water pollution control work, a Storm Water Pollution Prevention Plan, hereafter referred to as the "SWPPP," is required for this contract. The SWPPP shall conform to the provisions in Section 7-1.01G, "Water Pollution," of the Standard Specifications, the requirements in the Handbook, the requirements of the Permit, and these special provisions. Upon the Engineer's approval of the SWPPP, the SWPPP shall be deemed to fulfill the provisions in Section 7-1.01G of the Standard Specifications for development and submittal of a Water Pollution Control Program. The requirement to waive the submission of a written program for control of water pollution as provided in Section 7-1.01G, "Water Pollution," of the Standard Specifications shall not be allowed.

No work having potential to cause water pollution, as determined by the Engineer, shall be performed until the SWPPP has been approved by the Engineer.

Within 30 days after the approval of the contract, the Contractor shall submit 4 copies of the SWPPP to the Engineer. The Engineer will have 15 days to review the SWPPP. If revisions are required, as determined by the Engineer, the Contractor shall revise and resubmit the SWPPP within 7 days of receipt of the Engineer's comments. The Engineer will have 7 days to review the revisions. Upon the Engineer's approval of the SWPPP, 4 additional copies of the SWPPP, incorporating the required changes, shall be submitted to the Engineer. In order to allow construction activities to proceed, the Engineer may conditionally approve the SWPPP while minor revisions are being completed.

The SWPPP shall identify pollution sources that may adversely affect the quality of storm water discharges associated with the project and shall identify water pollution control measures, hereafter referred to as control measures, to be constructed, implemented, and maintained in order to reduce to the extent feasible pollutants in storm water discharges from the construction site both during and after construction is completed under this contract. Throughout the duration of the project, the SWPPP shall be amended to reflect changes in field conditions which necessitate changes to the deployment of water pollution control measures as determined by the Engineer. At a minimum, the SWPPP shall be amended 30 days prior to the beginning of each winter season.

The SWPPP shall incorporate control measures in the following categories:

- A. Soil stabilization practices;
- B. Sediment control practices;
- C. Sediment tracking control practices;
- D. Wind erosion control practices; and
- E. Non-storm water management and waste management and disposal control practices.

Specific objectives and minimum requirements for each category of control measures are contained in the Handbook.

The Contractor shall consider the objectives and minimum requirements presented in the Handbook for each of the above categories. The special minimum requirements listed below supersede the minimum requirements listed in the Handbook for the same category. When minimum requirements are listed for any category, the Contractor shall incorporate into the SWPPP, and implement on the project, the listed minimum controls required in order to meet the pollution control objectives for the category. In addition, the Contractor shall consider other control measures presented in the Handbook and shall incorporate into the SWPPP and implement on the project the control measures necessary to meet the objectives of the SWPPP. The Contractor shall document the selection process in conformance with the procedure specified in the Handbook. The following special minimum requirements are established:

Category	Minimum Requirement(s)
Soil Stabilization Practices	CD23 Preservation of Existing Vegetation CD26B Geotextiles, Mats/Plastic Covers & Erosion Control Blankets
Sediment Control Practices	CD36 Silt Fences CD38 Sandbag Barrier CD40 Storm Drain Inlet Protection CD41 Sediment Traps
Sediment Tracking Control Practices	CD29A Stabilized Construction Entrance CD29C Entrance/Outlet Tire Wash
Wind Erosion Control Practices	
Non-Storm Water and Waste Management and Disposal Control Practices	CD8 Paving Operations CD10 Material Delivery and Storage CD11 Material Use CD12 Spill Prevention CD13 Solid Waste Management CD 14 Hazardous Waste Management CD15 Contaminated Soil Management CD16 Concrete Waste Management CD17 Sanitary/Septic Waste Management CD18 Vehicle & Equipment Cleaning CD19 Vehicle & Equipment Fueling CD20 Vehicle & Equipment Maintenance CD44 Illicit Discharge/Illegal Dumping Detection and Reporting

The following contract items of work, where shown on the project plans, shall be incorporated in the SWPPP as critical temporary control measures: Temporary Cover, Temporary Concrete Washout Facility, Temporary Entrance/Exit, Temporary Drainage Inlet Protection, and Temporary Silt Fence. The Contractor shall consider other control measures to supplement the critical temporary control measures when necessary to meet the pollution control objectives of the SWPPP.

The following contract items of work, as shown on the project plans, shall be incorporated in the SWPPP as permanent post-construction control measures: Fiber Rolls, Fiber Roll Check Dam, and Erosion Control (Type D). These control measures shall be utilized as construction period control measures. Attention is directed to "Order of Work" of these special provisions. The Contractor shall consider other control measures to supplement these permanent, post-construction control measures when necessary to meet the pollution control objectives of the SWPPP. The Contractor shall maintain and protect the permanent control measures throughout the duration of the project and shall restore these controls to the lines and grades shown on the plans prior to acceptance of the project.

The SWPPP shall include, but not limited to, the following items as described in the Handbook and Permit:

- A. Source Identification;
- B. Erosion and Sediment Controls;
- C. Non-Storm Water Management;
- D. Waste Management and Disposal;
- E. Maintenance, Inspection and Repair;
- F. Training;
- G. List of Contractors and Subcontractors;
- H. Post-Construction Storm Water Management;
- I. Preparer;
- J. Copy of the Permit;
- K. BMP Consideration Checklist;
- L. SWPPP Checklist;
- M. Schedule of Values; and
- N. Water Pollution Control Drawings.

The Contractor shall amend the SWPPP, graphically and in narrative form, whenever there is a change in construction activities or operations which may affect the discharge of significant quantities of pollutants to surface waters, ground waters, municipal storm drain systems or when deemed necessary by the Engineer. The SWPPP shall be amended if the SWPPP is in violation of any condition of the Permit, or has not effectively achieved the objective of reducing pollutants in storm water

discharges. Amendments shall show additional control measures or revised operations, including those in areas not shown in the initially approved SWPPP, which are required on the project to control water pollution effectively. Amendments to the SWPPP shall be submitted for review and approval by the Engineer in the same manner specified for the initially approved SWPPP. Approved amendments shall be dated and logged in the SWPPP. Upon approval of the amendment, the Contractor shall implement the additional control measures or revised operations.

The Contractor shall keep a copy of the SWPPP and approved amendments at the project site. The SWPPP shall be made available upon request of a representative of the Regional Water Quality Control Board, State Water Resources Control Board, United States Environmental Protection Agency or the local storm water management agency. Requests by the public shall be directed to the Engineer.

By June 15 of each year, the Contractor shall submit an annual certification to the Engineer stating conformance with the requirements governing the Permit. If the project is in non-compliance at any time, as determined by the Engineer, the Contractor shall submit a written report to the Engineer within 2 days of identification of non-compliance. The report shall specify the time and nature of non-compliance and include a course of action to correct the deficiency. Non-compliance shall include, but not be limited to, any of the following conditions:

- A. Any written notices, violations, or orders presented by a regulatory agency.
- B. Control measures in the field are not implemented or maintained as provided for in the approved Storm Water Pollution Prevention Plan and amendments.
- C. The Contractor fails to respond to written requests for corrective actions.
- D. The Contractor refuses to submit an annual certification.
- E. Contractor discharges unauthorized materials, residues, or liquids to drainage conveyances or water bodies.

If the project is in non-compliance, the Engineer may impose one or more of the following actions:

- A. Direct the Contractor to revise the operations and SWPPP;
- B. A suspension of work on any contract item associated with the non-compliance, until both water pollution control measures and SWPPP are amended and approved by the Engineer;
- C. Notification to the Regional Water Quality Control Board of the non-compliance status;
- D. Deductions as provided for elsewhere in these special provisions.

SCHEDULE OF VALUES

The Contractor shall submit with the SWPPP, for approval by the Engineer, a schedule of values detailing the cost breakdown of the contract lump sum item for water pollution control. The cost breakdown shall include both the special minimum requirements required by the Department and those selected by the Contractor for this project. The combined requirements shall be considered as items of work as part of the lump sum bid. The schedule of values shall reflect the total items of work, including both those required by the Department and those selected by the Contractor. The contractor shall indicate quantities and costs for the control measures shown in the schedule of values, except for critical temporary controls and permanent control measures which are shown on the project plans and for which there is a contract item of work. Adjustments in the items of work and quantities listed in the schedule of values shall be made when required to address approved amendments to the SWPPP.

The sum of the amounts for the units of work listed in the schedule of values shall be equal to the contract lump sum price for water pollution control.

If approved in writing by the Engineer, the schedule of values will be used to determine progress payments for water pollution control during the progress of the work. The schedule of values will be used as the basis for calculating any adjustment in compensation for the contract item for water pollution control due to changes in the work ordered by the Engineer.

SWPPP IMPLEMENTATION

Upon approval of the SWPPP, the Contractor shall be responsible throughout the duration of the project for installing, constructing, inspecting, and maintaining the control measures included in the SWPPP and any amendments thereto and for removing and disposing of temporary control measures. Unless otherwise directed by the Engineer or specified in these special provisions, the Contractor's responsibility for SWPPP implementation shall continue throughout any temporary suspension of work ordered in conformance with the provisions in Section 8-1.05, "Temporary Suspension of Work," of the Standard Specifications. Requirements for installation, construction, inspection, maintenance, removal, and disposal of control measures are specified in the Handbook and these special provisions.

Soil stabilization practices and sediment control measures, including minimum requirements, shall be provided throughout the winter season, defined as between October 1 and May 1.

Implementation of soil stabilization practices and sediment control measures for soil-disturbed areas on the project site shall be completed, except as provided for below, not later than 20 days prior to the beginning of the winter season or upon start of applicable construction activities for projects which begin either during or within 20 days of the winter season.

Throughout the winter season, the active, soil-disturbed area of the project site shall be not more than 2 hectares. The Engineer may approve, on a case-by-case basis, expansions of the active, soil-disturbed area limit. The Contractor shall demonstrate the ability and preparedness to fully deploy soil stabilization practices and sediment control measures to protect soil-disturbed areas on the project site before the onset of precipitation. A quantity of soil stabilization and sediment control materials shall be maintained on site equal to 125 percent of that sufficient to protect unprotected, soil-disturbed areas on the project site. A detailed plan for the mobilization of sufficient labor and equipment shall be maintained to fully deploy control measures required to protect unprotected, soil-disturbed areas on the project site prior to the onset of precipitation. A current inventory of control measure materials and the detailed mobilization plan shall be included as part of the SWPPP.

Throughout the winter season, soil-disturbed areas of the project site shall be considered to be nonactive whenever soil disturbing activities are expected to be discontinued for a period of 20 or more days and the areas are fully protected. Areas that will become nonactive either during the winter season or within 20 days thereof shall be fully protected with soil stabilization practices and sediment control measures within 10 days of the discontinuance of soil disturbing activities or prior to the onset of precipitation, whichever is first to occur.

Throughout the winter season, active soil-disturbed areas of the project site shall be fully protected at the end of each day with soil stabilization practices and sediment control measures unless fair weather is predicted through the following work day. The weather forecast shall be monitored by the Contractor on a daily basis. The National Weather Service forecast shall be used. An alternative weather forecast proposed by the Contractor may be used if approved by the Engineer. If precipitation is predicted prior to the end of the following work day, construction scheduling shall be modified, as required, and functioning control measures shall be deployed prior to the onset of the precipitation.

The Contractor shall implement, year-round and throughout the duration of the project, control measures included in the SWPPP for sediment tracking, wind erosion, non-storm water management and waste management and disposal.

MAINTENANCE

To ensure the proper implementation and functioning of control measures, the Contractor shall regularly inspect and maintain the construction site for the control measures identified in the SWPPP. The Contractor shall identify corrective actions and time needed to address any deficient measures or reinitiate any measures that have been discontinued.

The construction site inspection checklist provided in the Handbook shall be used to ensure that the necessary measures are being properly implemented, and to ensure that the control measures are functioning adequately. One copy of each site inspection record shall be submitted to the Engineer.

Inspections of the construction site shall be conducted by the Contractor to identify deficient measures, as follows:

- A. Prior to a forecast storm;
- B. After any precipitation which causes runoff;
- C. At 24 hour intervals during extended precipitation events; and
- D. Routinely, at a minimum of once every week.

If the Contractor or the Engineer identifies a deficiency in the deployment or functioning of an identified control measure, the deficiency shall be corrected immediately. The deficiency may be corrected at a later date and time if requested by the Contractor and approved by the Engineer in writing, but not later than the onset of subsequent precipitation. The correction of deficiencies shall be at no additional cost to the State. When any deficiency is not corrected within the time frame prescribed by the Engineer, then the project shall be in non-compliance.

PAYMENT

The contract lump sum price paid for prepare storm water pollution prevention plan shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals for doing all the work involved in developing, preparing, obtaining approval of, revising, and amending the SWPPP, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Attention is directed to Section 9-1.06, "Partial Payments," and Section 9-1.07, "Payment After Acceptance," of the Standard Specifications. Payments for prepare storm water pollution prevention plan will be made as follows:

- A. After the SWPPP has been approved by the Engineer, 75 percent of the contract item price for prepare storm water pollution prevention plan will be included in the monthly partial payment estimate; and
- B. After acceptance of the contract pursuant to Section 7-1.17, "Acceptance of Contract," payment for the remaining 25 percent of the contract item price for prepare storm water pollution prevention plan will be made in conformance with the provisions in Section 9-1.07.

The contract lump sum price paid for water pollution control shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing, constructing, maintaining, removing, and disposing of control measures, except those shown on the plans and for which there is a contract item of work, and excluding developing, preparing, obtaining approval of, revising, and amending the SWPPP, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for changes in control measures required by an approved amendment to the SWPPP, except changes to those control measures shown on the plans and for which there is a contract item of work, shall be considered as included in the lump sum bid for the various items of work and no additional compensation will be allowed thereafter except changes to control measures required as a result of extra work as provided in Section 4-1.03D of the Standard Specifications and the following:

- A. If the control measure is listed in the approved SWPPP schedule of values, an adjustment in compensation for the contract item for water pollution control will be made by applying the increase or decrease in quantities to the approved schedule of values. No adjustment of compensation will be made to the unit price listed for items in the schedule of values due to any increase or decrease in the quantities, regardless of the reason for the increase or decrease. The provisions in Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications shall not apply to items listed in the schedule of values.
- B. If the control measure is not listed in the approved SWPPP schedule of values, payment will be made by force account.

Those control measures which are shown on the plans and for which there is a contract item of work will be measured and paid for as that contract item of work.

The Engineer will retain an amount equal to 25 percent of the estimated value of the contract work performed during estimate periods in which the Contractor fails to conform to the provisions of this section "Water Pollution Control" or if the project is in non-compliance as determined by the Engineer. The State will endeavor to work with the Contractor to correct noted deficiencies, however, no written notice is required prior to retaining funds under this section.

Retentions for failure to conform to the provisions in this section "Water Pollution Control" shall be in addition to the other retentions provided for in the contract. The amounts retained for failure of the Contractor to conform to the provisions in this section will be released for payment on the next monthly estimate for partial payment following the date that an approved SWPPP has been implemented and maintained, and water pollution is adequately controlled, as determined by the Engineer.

UNIT DESCRIPTION	UNIT	QUANTITY	VALUE	AMOUNT
CD8 Paving Operations	LS	Lump Sum		
CD10 Material Delivery and Storage	LS	Lump Sum		
CD11 Material Use	LS	Lump Sum		
CD12 Spill Prevention	LS	Lump Sum		
CD13 Solid Waste Management	LS	Lump Sum		
CD14 Hazardous Waste Management	LS	Lump Sum		
CD15 Contaminated Soil Management	LS	Lump Sum		
CD16 Concrete Waste Management	LS	Lump Sum		
CD17 Sanitary/Septic Waste Management	LS	Lump Sum		
CD18 Vehicle & Equipment Cleaning	LS	Lump Sum		
CD19 Vehicle & Equipment Fueling	LS	Lump Sum		
CD20 Vehicle & Equipment Maintenance	LS	Lump Sum		
CD23 Preservation of Existing Vegetation	LS	Lump Sum		
CD26B Geotextiles, Mats, Plastic Covers & Erosion Control Blankets	LS	Lump Sum		
CD29A Stabilized Construction Entrance	EA	Each		
CD29C Entrance/Outlet Tire Wash	EA	Each		
CD36 Silt Fences	M	Meter		
CD38 Sandbag Barrier	M	Meter		
CD40 (2) Storm Drain Inlet Protection	LS	Lump Sum		
CD41 Sediment Traps	LS	Lump Sum		
CD44 Illicit Discharge/Illegal Dumping Detection and Reporting	LS	Lump Sum		
			TOTAL	

10-1.07 ELECTRONIC MOBILE DAILY DIARY COMPUTER SYSTEM DATA DELIVERY

Attention is directed to Sections 5-1.10, "Equipment and Plants," and 7-1.01A(3), "Payroll Records," of the Standard Specifications, and these special provisions.

The Contractor shall submit to the Engineer a list of each piece of equipment and its identifying number, type, make, model and rate code in accordance with the Department of Transportation publication entitled "Labor Surcharge and Equipment Rental Rate" which is in effect on the date the work is performed, and the names, labor rates and work classifications for all field personnel employed by the Contractor and all subcontractors in connection with the public work, together with such additional information as is identified below. This information shall be updated and submitted to the Engineer weekly through the life of the project.

This personnel information will only be used for this mobile daily diary computer system and it will not relieve the Contractor and subcontractors from all the payroll records requirements as required by Section 7-1.01A(3), "Payroll Records," of the Standard Specifications.

The Contractor shall provide the personnel and equipment information not later than 11 days after the contract award for its own personnel and equipment, and not later than 5 days before start of work by any subcontractor for the labor and equipment data of that subcontractor.

The minimum data to be furnished shall comply with the following specifications:

DATA CONTENT REQUIREMENTS.

- A. The Contractor shall provide the following basic information for itself and for each subcontractor that will be used on the contract:

Caltrans contract ID	Alphanumeric; up to 15 characters.
Company name.	Alphanumeric; up to 30 characters.
Federal tax ID	Alphanumeric; up to 10 characters.
State contractor license	Alphanumeric; up to 20 characters.
Company type (prime or sub)	Alphanumeric; up to 10 characters.
Address (line 1).	Alphanumeric; up to 30 characters.
Address (line 2).	Alphanumeric; up to 30 characters.
Address (city).	Alphanumeric; up to 30 chars.
Address (2-letter state code).	Alphanumeric; up to 2 characters.
Address (zip code)	Alphanumeric; up to 14 characters.
Contact FirstNname.	Alphanumeric; up to 15 characters
Contact LastName	Alphanumeric; up to 20 characters
Telephone number (with area code).	Alphanumeric; up to 20 characters.
Company code: short company name.	Alphanumeric; up to 10 characters.
Type of work (Department-supplied codes)	Alphanumeric; up to 30 characters
DBE status (Department-supplied codes)	Alphanumeric; up to 20 characters.
Ethnicity for DBE status (Department-supplied codes).	Alphanumeric; up to 20 characters.
List of laborers to be used on this contract (detail specified below).	
List of equipment to be used on this contract (detail specified below).	

For example, one such set of information for a company might be:

04-072359

XYZ CONSTRUCTION, INC.

94-2991040

AL1649T

SUB

1240 9TH STREET

SUITE 600

OAKLAND

CA

94612

JOHN

SMITH

(510) 834-9999

XYZ

PAVING

MBE

BLACK

B. The Contractor shall provide the following information for each laborer who will be used on the contract:

Caltrans contract ID	Alphanumeric; up to 15 characters.
Company code (as defined above).	Alphanumeric; up to 10 characters.
Employee ID	Alphanumeric; up to 10 characters.
Last name.	Alphanumeric; up to 20 characters.
First name.	Alphanumeric; up to 15 characters.
Middle name.	Alphanumeric; up to 15 characters.
Suffix	Alphanumeric; up to 15 characters
Labor trade (Department-provided codes).	Alphanumeric; up to 10 characters.
Labor classification (Department-provided codes).	Alphanumeric; up to 10 characters.
Regular hourly rate.	Alphanumeric; up to (6,2)
Overtime hourly rate.	Alphanumeric; up to (6,2)
Doubletime hourly rate	Alphanumeric; up to (6,2)
Standby hourly rate.	Alphanumeric; up to (6,2)
Ethnicity (Department-provided codes).	Alphanumeric; up to 20 characters.
Gender.	Alphanumeric; up to 1 characters.

For example, one such set of information might be:

04-072359

XYZ

1249

GONZALEZ

HECTOR

VINCENT

JR.

OPR

JNY

12.50

18.75

25.00

0.00

HISPANIC

M

C. The Contractor shall provide the following information for each piece of equipment that will be used on the contract:

Caltrans contract ID	Alphanumeric; up to 15 characters.
Company code (as defined above).	Alphanumeric; up to 10 characters.
Company's equipment ID number.	Alphanumeric; up to 10 characters.
Company's equipment description.	Alphanumeric; up to 60 characters.
Equipment type (from Department ratebook).	Alphanumeric; up to 60 characters.
Equipment make (from Department ratebook).	Alphanumeric; up to 60 characters.
Equipment model (from Department ratebook).	Alphanumeric; up to 60 characters.
Equipment rate code (from Department ratebook).	Alphanumeric; up to 10 characters
Regular hourly rate.	Alphanumeric; up to (6,2)
Overtime hourly rate.	Alphanumeric; up to (6,2)
Standby hourly rate	Alphanumeric; up to (6,2)
Idle hourly rate.	Alphanumeric; up to (6,2)
Rental flag.	Alphanumeric; up to 1 character.

For example, one such set of information might be:

04-072359

XYZ

B043

CAT TRACTOR D-6C

TRACC

CAT

D-6C

3645

75.00

75.00

0.00

0.00

N

DATA DELIVERY REQUIREMENTS.

- A. All data described in "Data Requirements" of this section shall be delivered to the Department electronically, on 3 1/2" floppy disks compatible with the Microsoft Windows operating system. The Contractor shall provide a weekly disk and hard copy of the required correct updated personnel and equipment information for the Contractor and all the subcontractors and verified correct by the Engineer.
- B. Data of each type described in the previous section (contractor, labor, and equipment information) will be delivered separately, each type in one or more files on floppy disk. Any given file may contain information from one contractor or from multiple contractors, but only one type of data (contractor, labor, or equipment information).
- C. The file format for all files delivered to Caltrans shall be standard comma-delimited, plain text files. This type of file (often called "CSV") is the most standard type for interchange of formatted data; it can be created and read by all desktop spreadsheet and desktop database applications. Characteristics of this type of file are:
 1. All data is in the form of plain ASCII characters.
 2. Each row of data (company, person, equipment) is delimited by a carriage return character.
 3. Within rows, each column (field) of data is delimited by a comma character.
- D. The files shall have the following columns (i.e., each row shall have the following fields):
 1. Contractor info: 17 columns (fields) as specified in "Data Requirements #1", above.
 2. Labor info: 15 columns (fields) as specified in "Data Requirements #2", above.
 3. Equipment info: 13 columns (fields) as specified in "Data Requirements #3", above.

For every one type of file, columns (fields) must be in the order specified under "Data Requirements", above. All columns (fields) described under "Data Requirements" must be present for all rows, even if some column (field) values are empty. The first row of each file must contain column headers (in plain text).

- E. Column (field) contents must conform to the data type and length requirements described in the "Data Requirement" section, above. In addition, column (field) data must conform to the following restrictions:
 1. All data shall be uppercase.
 2. Company type shall be either "PRIME" or "SUB".
 3. Labor trade and classification codes must conform to a list of standard codes that will be supplied by Department.
 4. Contractor type of work codes and DBE status codes must conform to a list of standard codes that will be supplied by Department.
 5. Ethnicity codes must conform to standard codes that will be supplied by Department.
 6. Data in the "gender" column must be either "M" or "F".
 7. Data in the "rental equipment" column must be either "Y" or "N".
 8. Equipment owner's description may not be omitted. (The description, together with the equipment number, is how the equipment will be identified in the field.) Include manufacturer, rated capacity & trade description
 9. Equipment type, make, model, and ratebook code shall conform to the Department of Transportation Publication entitled "Labor Surcharge and Equipment Rental Rate", which is in effect on the date the work is

performed. If the equipment in question does not have an entry in the book then alternate, descriptive entries may be made in these fields as directed by the Engineer.

- F. The name of each file must indicate its contents, e.g., "labor.csv" for laborers, "equipment.csv" for equipment, and "contractor.csv" for contractors. Each floppy disk supplied to Caltrans must be accompanied by a printed list of the files it contains with a brief description of the contents of each file.

PAYMENT.

Payment for providing electronic mobile daily diary computer system data delivery will be made on a lump sum basis. The lump sum bid price for electronic mobile daily diary computer system data delivery will be made according to the following schedule:

The Contractor will receive not more than 3.6 per cent per month of the total bid price for electronic mobile daily diary computer system data delivery .

After the completion of the work, 100 per cent payment will be made for electronic mobile daily diary computer system data delivery less the permanent deduction, if any, for failure to deliver complete weekly electronic mobile daily diary computer system data in each month.

The contract lump sum price paid for electronic mobile daily diary computer system data delivery shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in electronic mobile daily diary computer system data delivery as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The Department will retain an amount equal to 25 percent of the estimated value of the work performed during the first estimate period in which the Contractor fails to submit electronic mobile daily diary computer system data delivery conforming to the requirements of this section, as determined by the Engineer. Thereafter, on subsequent successive estimate periods the percentage the Department will retain will be increased at the rate of 25 percent per estimate period in which acceptable electronic mobile daily diary computer system data have not been submitted to the Engineer. Retentions for failure to submit acceptable electronic mobile daily diary computer system data shall be additional to all other retentions provided for in the contract. The retention for failure to submit acceptable electronic mobile daily diary computer system data will be released for payment on the next monthly estimate for partial payment following the date that acceptable electronic mobile daily diary computer system data is submitted to the Engineer.

The adjustment provisions in Section 4-1.03, "Changes," of the Standard Specifications, shall not apply to the item of electronic mobile daily diary computer system data delivery. Adjustments in compensation for electronic mobile daily diary computer system data delivery will not be made for any increased or decreased work ordered by the Engineer in furnishing electronic mobile daily diary computer system data.

10-1.08 TEMPORARY SILT FENCE

Temporary silt fence shall conform to the details shown on the plans and these special provisions.

Preparation shall conform to the provisions in Section 20-3.02, "Preparation," of the Standard Specifications.

Attention is directed to "Water Pollution Control" of these special provisions.

MATERIALS

Materials for temporary silt fence shall conform to the provisions in Section 20-2, "Materials," of the Standard Specifications and one of the following:

Temporary silt fence shall be a prefabricated silt fence with a minimum woven polypropylene fabric width of 900 mm and a minimum tensile strength of 0.44-kN, conforming to the requirements of ASTM Designation: D 4632.

Temporary silt fence shall be a prefabricated silt fence with a minimum woven polypropylene fabric width of 900 mm and a minimum tensile strength of 0.44-kN, conforming to the requirements of ASTM Designation: D 4632 and having an integral reinforcement layer. The reinforcement layer shall be a polypropylene or equivalent net provided by the manufacturer.

INSTALLATION

Temporary silt fence shall be installed as shown on the plans.

When joints are necessary, the temporary silt fence shall overlap a minimum of 150 mm with both posts tied together.

Temporary silt fences shall be maintained to provide for adequate sediment holding capacity. Sediment deposits shall be removed when the sediment deposit reaches approximately one-third of the fence height. Removed sediment shall be deposited within the project in such a way that the sediment is not subject to erosion by wind or water, or as directed by the Engineer.

When no longer required for the intended purpose, as determined by the Engineer, temporary silt fence shall be removed from the site of the work.

Holes, depressions or any other ground disturbance caused by the removal of the temporary silt fence shall be backfilled and repaired in conformance with the provisions in the second paragraph of Section 15-1.02, "Preservation of Property," of the Standard Specifications.

MEASUREMENT AND PAYMENT

The quantity of temporary silt fence will be measured by the meter as determined from actual measurements, the measurements to be made parallel with the ground slope along the line of the completed temporary silt fence, deducting the widths of openings.

The contract price paid per meter for temporary silt fence shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing temporary silt fence, complete in place, including trench excavation and backfill, and maintenance and removal of temporary silt fence, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Temporary silt fence placed at location other than as shown on the project plans or directed by the Engineer, in conformance with the Contractor's Storm Water Pollution Prevention Plan (SWPPP), will not be measured and will be paid for as specified in "Water Pollution Control" of these special provisions.

No adjustment of compensation will be made for any increase or decrease in the quantities of temporary silt fence required, regardless of the reason for the increase or decrease. The provisions in Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications shall not apply to temporary silt fence.

10-1.09 TEMPORARY FENCE (TYPE ESA)

Temporary fence (Type ESA) shall be furnished, constructed, maintained, and later removed as shown on the plans, as specified in these special provisions and as directed by the Engineer.

Temporary fence (Type ESA) shall be constructed prior to any clearing and grubbing work and a sufficient distance from protected plants to enclose all of the foliage canopy and not encroach upon visible roots of the plants.

Temporary fence (Type ESA) shall be located so that it will be obvious to heavy equipment operators.

Used materials may be installed provided the used materials are good, sound and are suitable for the purpose intended, as determined by the Engineer.

Materials may be commercial quality provided the dimensions and sizes of the materials are equal to, or greater than, the dimensions and sizes shown on the plans or specified herein. Fabric used for Temporary fence (Type ESA) shall also conform to the following:

Material:	Polypropylene or Polyethylene
Color:	Orange
Mesh opening:	50 mm x 50 mm
UV Resistance:	Fully Stabilized
Fabric Width, min.:	1.22 m

Posts shall be either metal or wood at the Contractor's option, and shall be suitable for the purpose intended. Metal posts shall have a minimum diameter of 21.5 mm x 1600 mm in length. Wood posts shall be fir or pine and shall be a minimum of 25 mm x 50 mm x 1600 mm in length. Posts shall be driven into the soil a minimum of 400 mm. Post spacing shall be adequate to completely support the fence fabric in an upright position.

Galvanizing and painting of steel items will not be required.

Treating wood with a wood preservative will not be required.

Concrete footings for posts will not be required.

Temporary fence (Type ESA) that is damaged during the progress of the work shall be repaired or replaced by the Contractor at the Contractor's expense.

When no longer required for the work, as determined by the Engineer, temporary fence (Type ESA) shall be removed. Removed facilities shall become the property of the Contractor and shall be removed from the site of the work, except as otherwise provided in this section.

Holes caused by the removal of temporary fence (Type ESA) shall be backfilled in conformance with the provisions in the second paragraph of Section 15-1.02, "Preservation of Property," of the Standard Specifications.

MEASUREMENT AND PAYMENT

Temporary fence (Type ESA) shall be measured in the manner specified for permanent fences in Section 80, "Fences", of the Standard Specifications.

The contract price paid per meter for temporary fence (Type ESA) shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in constructing temporary fence (Type

ESA) complete in place, including installation, maintenance, removal and disposal of materials as specified in these special provisions and as directed by the Engineer.

10-1.10 TEMPORARY ENTRANCE/EXIT

Temporary entrance/exit and clean out sump shall conform to the details shown on the plans and these special provisions. The minimum quantity of temporary entrance/exit required for this project shall be 6 (six).

The Contractor shall provide as many temporary construction entrance/exits and clean out sumps as required for the duration of the contract. Attention is directed to "Water Pollution Control" elsewhere in these special provisions.

10-1.11 NON-STORM WATER DISCHARGES.

Non-storm water discharges shall conform to the requirements in Section 7-1.01G, "Water Pollution" of the Standard Specifications and these special provisions

Conformance with the requirements of this section shall in no way relieve the Contractor from the Contractor's responsibilities, as provided in Section 7-1.11, "Preservation of Property," and Section 7-1.12, "Responsibility for Damage," of the Standard Specifications.

MARINE EXCAVATION DEWATERING

Suspended solids shall be removed during the dewatering operation for marine-based piles and cofferdams as specified in these special provisions.

Suspended solids shall be removed to the extent that visible, floating products are not apparent within the discharge. Also, the discharge shall be of a purity such that turbidity and apparent color beyond present natural background levels are not apparent within the receiving water body. The turbidity, measured in Nephelometric Turbidity Units (NTU), of the discharge shall not be greater than a 10 percent increase of the background turbidity. The point of effluent discharge shall not cause bottom sediments or aquatic vegetation to become dislodged or disturbed.

The Contractor shall graphically depict the dewatering process within the Storm Water Pollution Prevention Plan (SWPPP), as specified in "Water Pollution Control" of these special provisions. The graphic shall show both a sectional and plan view that details the removal techniques for suspended solids. The graphic shall define the flow path and placement of pipes, hoses, pumps, and other equipment used to convey the discharge. In addition, the contractor shall provide a sketch that depicts the general position of the apparatus relative to the pile(s) or cofferdam(s) undergoing dewatering and the point of effluent discharge.

The Contractor shall describe the dewatering apparatus within the appropriate sections of the SWPPP. The description shall include, but not be limited to, an estimate of the discharge volume, flow rate, and frequency; location of discharge; and the inspection and monitoring procedures related to the discharge.

The Contractor shall conduct a daily inspection of the dewatering equipment, when in use, to ensure that all components are functional and routinely maintained to prevent leakage prior to removal of suspended solids. Any component of the apparatus that is found to be damaged or to affect the performance of the apparatus shall be either immediately repaired or replaced.

The Contractor shall monitor both the discharge and the receiving water body. The observations made during monitoring shall include the color, size of affected area, presence of suspended material, presence of water fowl or aquatic wildlife, wind direction and velocity, tidal condition, atmospheric condition, time, and date. In addition, the Contractor shall supplement the observations with photographs. During monitoring events, the Contractor shall obtain NTU measurements for the discharge turbidity and the receiving water turbidity. The Contractor shall conduct monitoring, at a minimum, one hour prior to discharge, during the first ten minutes of initiating discharge, every four hours during discharge, and upon cessation of discharge. The receiving water turbidity will be measured at a location that is unaffected by the discharge. The observations and turbidity measurements shall be recorded daily in a tabular format known as the monitoring report provided within the Conceptual Storm Water Pollution Prevention Plan, as described within "Water Pollution Control" of these special provisions. The monitoring report, including photographs, shall be provided weekly to the Engineer, or as directed by the Engineer.

Observations or measurements which indicate that the discharge is of a purity such that turbidity and apparent color are beyond the present natural background levels shall be immediately reported to the Engineer. The discharge activity shall immediately cease, so that corrective actions are undertaken to repair, modify, or replace the equipment. The resumption of discharge activities shall be allowed upon approval of the corrective measures by the Engineer.

STOCKPILE DEWATERING

The Contractor shall prevent the flow of water, including groundwater, surface runoff and tidal flow from entering any temporary stockpiles on land.

The Contractor shall depict and describe within the Storm Water Pollution Prevention Plan (SWPPP), as specified in "Water Pollution Control" of these special provisions, the methods and measures that will be used to dewater the temporary

stockpiles when free liquids are present, to seal the sides and bottom of the temporary stockpiles, and to prevent the flow of water into the stockpiles. Operations producing water will not be permitted until the Engineer has approved the plan.

All water removal from temporary stockpiles shall be handled in accordance with National Pollutant Discharge Elimination System (NPDES) Permits CAS000002 and CAS000003, issued by the State Water Resource Control Board. Copies of the permit and its amendments will be available for inspection and purchase at the Department of Transportation, Toll Bridge Duty Senior's Desk, 111 Grand Avenue, Oakland, California. Please call the Toll Bridge Duty Senior, telephone number (510) 286-5549 to reserve a copy of the document at least 24 hours in advance.

The Contractor is responsible for all work, records, reports, and costs involved in handling the water in accordance with the NPDES permit. The Contractor shall supply all analytical data, dewatering volume records, and written requests for discharge to the Engineer for approval prior to discharging any water. The Engineer shall have up to 7 calendar days for review and approval of discharge. Water that does not meet discharge permit requirements shall not be discharged on the site or to the storm drainage or to the sanitary sewer systems. The Contractor is responsible for either treating the water to meet the permit requirements for discharge or hauling the water off site to an appropriately licensed liquid disposal facility. Penalties assessed against the State for permit non-compliance by the Contractor will be borne by the Contractor. Such penalties will be deducted from the monthly progress payment.

LAND-BASED EXCAVATION DEWATERING

This work shall consist of dewatering and discharging water from land-based excavations including, but not limited to, footing excavations, and excavations for retaining walls, storm drainage systems, sanitary sewer systems and their appurtenances, except as specified in "Pier 5 Excavation Dewatering" of this special provision. The Contractor shall test groundwater prior to discharge for conformance with NPDES permits CAS000002 and CAS000003, and these special provisions. At the Contractor's option, test samples to confirm contaminant concentrations may be collected from the groundwater in the excavation or from closed-top watertight, transportable holding tanks furnished by the Contractor. The holding tanks shall have sufficient capacity to prevent delay of other work. Groundwater that has contaminant concentrations above the allowable concentrations specified in these special provisions shall be treated prior to discharge. Surface runoff shall not be permitted to enter the excavation. Groundwater contaminated by the Contractor's operations, such as use of slurry cement backfill to construct cast-in-drilled-hole piles, shall be treated to meet the permit requirements for discharge or hauled off site to an appropriately licensed liquid disposal facility. A meter that has been approved by the Engineer shall be used to measure all excavation discharges.

The Contractor shall submit to the Engineer, as provided in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications, a plan which details the methods and measures that will be used to seal the sides and bottom of excavations, prevent the flow of water into excavations, and remove known or introduced groundwater contaminants. The plan shall, at a minimum, contain a graphic for the dewatering operation showing both a sectional and plan view that details the removal techniques for suspended solids and known or introduced groundwater contaminants. The graphic shall define the flow path and placement of pipes, hoses, pumps, and other equipment used to convey the discharge. In addition, the Contractor shall provide a drawing that depicts the general position of the dewatering measures relative to the excavations undergoing dewatering and the point of effluent discharge. The written descriptions of the dewatering operation shall include, but are not limited to, an estimate of the discharge volume, flow rate, and frequency; location of discharge; performance capabilities of treatment measures; and the inspection and monitoring procedures related to the discharge.

The plan shall be submitted, at least, 3 weeks prior to beginning excavation operations. The Contractor shall allow 10 days for the Engineer to review and approve the plan. If revisions are required, as determined by the Engineer, the Contractor shall revise and resubmit the plan within 5 days of receipt of the Engineer's comments and shall allow 5 days for the Engineer to review the revisions. Excavation operations shall not be allowed until the Engineer has approved the plan.

Suspended solids shall be removed during the dewatering operation of any excavation, as specified in these special provisions.

Suspended solids shall be removed to the extent that visible, floating products are not apparent within the discharge. Also, the discharge shall be of a purity such that turbidity and color beyond present natural background levels are not apparent within the receiving water body. The turbidity, measured in Nephelometric Turbidity Units (NTU), of the discharge shall not be greater than a 10 percent increase of the background turbidity of the receiving water body. The point of effluent discharge shall not cause bottom sediments, aquatic vegetation, or surface soils to become dislodged or disturbed.

Petroleum shall be removed during the dewatering operation in conformance with these special provisions.

The discharge into the receiving water body shall not contain total petroleum hydrocarbons beyond a maximum allowable concentration of 50 µg/L. Samples obtained from the discharge shall be analyzed in accordance with EPA methods 8015M. The detection limits for the analyses shall be equal to or less than the allowable discharge concentration.

The Contractor shall conduct a daily inspection of the dewatering equipment, when in use, to ensure that all components are functional and routinely maintained to prevent leakage prior to removal of suspended solids and petroleum hydrocarbons. Should any component of the dewatering equipment be damaged or affect the performance of the equipment, the dewatering operation shall be discontinued and the component shall be repaired or replaced with substitute equipment.

The Contractor shall monitor both the discharge and the receiving water body. The observations made during monitoring shall include the color, size of affected area, presence of suspended material, presence of water fowl or aquatic wildlife, wind direction and velocity, atmospheric condition, time, date, a turbidity measurement in NTU, and pH. The Contractor shall supplement the observations with photographs. The Contractor shall conduct monitoring, at a minimum of one hour prior to discharge, during the first 10 minutes of initiating discharge, and upon cessation of the discharge. The observations shall be recorded on the inspection forms to be provided by the Engineer. Completed inspection forms, including photographs, shall be provided to the Engineer, on a weekly basis or as directed by the Engineer.

Observations which indicate that the discharge is of a visible purity such that turbidity and apparent color are beyond the present natural background shall be immediately reported to the Engineer. The discharge activity shall cease so that corrective actions are undertaken to repair, modify or replace the equipment. The commencement of discharge activities shall be upon approval by the Engineer.

All water removed from excavations and dewatering operations in conformance with this section shall be handled as provided in 'Effluent Treatment Systems' elsewhere in this specification and in accordance with the discharge permit for contaminated groundwater issued by the San Francisco Bay Regional Water Board. Copies of the permit are available for inspection and purchase at the Department of Transportation, Toll Bridge Duty Senior's Desk, 111 Grand Avenue, Oakland, California, telephone (510) 286-5549. Penalties assessed against the State for permit non-compliance by the Contractor shall be borne by the Contractor. The Department will deduct those penalty amounts from any moneys due, or that may become due, the Contractor under the contract.

PIER 5 EXCAVATION DEWATERING

This work shall consist of removing and discharging water from the excavation for Pier 5. Groundwater within and adjacent to the excavation limits for Pier 5 contains heavy metals at concentrations greater than allowable for discharge under NPDES permits CAS000002 and CAS000003. Discharges of groundwater allowed to enter the excavation in conformance with the provisions in "Earthwork" of these special provisions shall be conducted in conformance with one or more of the following:

- A. The Department has obtained permission to discharge treated groundwater under a separate permit. The Contractor shall be fully informed of the provisions of the permit and shall conduct the work accordingly. Treatment of the groundwater shall be in conformance with "Effluent Treatment Systems" of this special provision. Copies of the permit are available for inspection and purchase at the Department of Transportation, Toll Bridge Duty Senior's Desk, 111 Grand Avenue, Oakland, California. Please call the Toll Bridge Duty Senior, telephone number (510) 286-5549 to reserve a copy of the document at least 24 hours in advance.
- B. The Department has made arrangements with Rhodia, Inc. to treat groundwater. Attention is directed to Section 10-1.26, "Earthwork" of these special provisions for conditions related to use of the Rhodia treatment plant.
- C. The Contractor shall haul the water off highway right of way to an appropriately licensed liquid disposal facility.

The Contractor shall submit to the Engineer, as provided in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications, a plan which details the methods and measures that will be used to treat and discharge the groundwater. The plan shall, at a minimum, contain a graphic for the dewatering operation showing both a sectional and plan view that details the removal techniques for suspended solids and known or introduced groundwater contaminants. The graphic shall define the flow path and placement of pipes, hoses, pumps, and other equipment used to convey the discharge. In addition, the Contractor shall provide a drawing that depicts the general position of the dewatering measures relative to the excavations undergoing dewatering and the point of effluent discharge. The written descriptions of the dewatering operation shall include, but are not limited to, an estimate of the discharge volume, flow rate, and frequency; location of discharge; performance capabilities of treatment measures; and the inspection and monitoring procedures related to the discharge.

The plan shall be submitted, at least, 3 weeks prior to beginning excavation operations. The Contractor shall allow 10 days for the Engineer to review and approve the plan. If revisions are required, as determined by the Engineer, the Contractor shall revise and resubmit the plan within 5 days of receipt of the Engineer's comments and shall allow 5 days for the Engineer to review the revisions. Excavation operations shall not be allowed until the Engineer has approved the plan.

EFFLUENT TREATMENT SYSTEMS

Effluent treatment systems shall be provided to treat groundwater discharged from excavations or dewatering operations as shown on the plans and in accordance with these special provisions. Effluent shall be considered as the water and any other material discharged from the pumping operations.

The Contractor shall use the effluent treatment systems to treat groundwater prior to discharging into the approved dedicated discharge site. Protection shall be provided at the outlet of treated effluent into the receiving water body to ensure that bottom sediments, aquatic vegetation, or surface soils do not become dislodged or disturbed.

Materials shall conform to the provisions in Section 6, "Control of Materials," Section 7-1.16, "Contractor's Responsibility for the Work and Materials," and Section 74-2, "Drainage Pump Equipment" of the Standard Specifications and these special provisions.

Holding tanks shall be transportable, totally enclosed, with a minimum holding capacity sufficient to prevent delay of other work and capable of connecting multiple tanks in series. Holding tanks shall have an inlet and outlet capable of receiving and discharging minimum flows, at a rate of 318 L/min. Holding tanks shall be able to accommodate temporary installation of submersible pumps of such capability to discharge water at a rate of 318 L/min. All tanks shall be of the same make and manufacturer and shall remain on the jobsite until dewatering operations are no longer necessary as determined by the Engineer.

A granulated activated carbon (GAC) system shall be used to treat groundwater contaminated with petroleum hydrocarbons, especially petroleum hydrocarbons of the motor oil range. The GAC treatment system shall consist of at least two vessels having an inlet and outlet capable of receiving and discharging water at a flow rate of 318 L/min. The GAC treatment system shall be capable of treating total petroleum hydrocarbons at an inflow concentration of 1 mg/L, such that the outflow concentration is less than or equal to an allowable concentration of 50 µg/L. GAC treatment vessels shall be readily capable of removal and replacement or interchange when required. The GAC treatment system shall have appropriate fittings for pipe connections designed to accommodate the flow rate. The Contractor shall throughout the operation have one additional GAC vessel available for transport and use at the site within one hour after being directed by the Engineer.

Sampling ports shall be spigots attached to the piping system and capable of obtaining a representative sample of water at each location of the GAC treatment system shown on the plans. The GAC treatment system shall be capable of sustaining temporary fluctuations in water pressure due to monitoring activities.

Pumps shall be capable of being submerged in water and discharging water and other materials including, but not limited to small rocks, gravel, sand and sediments. Two submersible pumps will be required for this project and shall be capable, at all times, of discharging at a flow rate of 318 L/min. In addition, a third submersible pump shall be provided by the Contractor that is capable of discharging treated effluent from the temporary holding container to the dedicated discharge location.

Plastic piping may be approved for use as determined by the Engineer in writing. If plastic piping is used, it shall conform to the provisions in section 20-5.03E, "Pipe" of the Standard Specifications. The Contractor shall be responsible for providing all piping required to circulate the effluent through the treatment system and all piping required to convey the treated effluent from the temporary holding container to the point of release at the dedicated discharge location.

A temporary holding container shall be provided with a minimum holding capacity of 1892 L. The holding container shall have an inlet and outlet capable of receiving and discharging minimum flows of 318 L/min. The holding container shall be open to the air and sealed on all sides and the bottom to prevent any leakage.

A chemical precipitation or ion exchange treatment system shall be used to treat groundwater discharged from the Pier 5 excavation. The treatment system shall be capable of removing metals in the effluent to the following concentrations:

Metal	Concentration (µg/L)
Arsenic	27.5
Cadmium	18.3
Chromium	55.0
Copper	55.0
Lead	55.0
Mercury	0.9
Nickel	275
Selenium	184
Silver	27.5
Zinc	642

Groundwater samples shall be made available to the bidders for conducting bench-scale assessments of proposed treatment systems upon request to the Toll Bridge Duty Senior's desk, 111 Grand Avenue, Oakland, California, telephone number (510) 286-5549. The request shall include the quantity required for the assessment. Samples will be available within 2 weeks of the request. The bidder shall arrange for shipment of the sample to the person making the assessment. The assessment results shall be submitted with the bidder's proposal.

The Contractor shall be responsible for maintaining all of the equipment and materials outlined in this special provision to operational levels necessary to comply with provisions outlined in these special provisions and permits issued for this project. If the Contractor or the Engineer identifies a deficiency in the functioning of any equipment or material, the deficiency shall be immediately corrected by the Contractor.

MONITORING

Monitoring shall occur daily for the first 7 days of operating GAC treatment system, and then be reduced to a frequency of once every 7 days thereafter. Upon relocation replacement, interchange, or maintenance of the GAC vessels the Contractor shall conduct daily monitoring for the first 7 days of resuming treatment operation, and then reduce the monitoring frequency to once every 7 days thereafter. The Contractor shall collect water samples from each sampling port of the GAC treatment system as depicted in the plans. Three samples shall be obtained from each sampling port during each monitoring event. The first of the three samples shall be analyzed for total suspended solids (TSS) in accordance with EPA method 160.1. The detection limit for the TSS analysis shall be at a maximum of 1 mg/L. The second sample shall be analyzed for total metals in accordance with EPA method 6010, and the third sample shall be analyzed for total petroleum hydrocarbons in accordance with EPA method 8015. The detection limits for total metals and total petroleum hydrocarbons shall be equal to or less than the allowable discharge concentration for each contaminant. Industry accepted standard operating procedures shall be used to ensure quality assurance and quality control of sampling and analysis procedures. Analytical results for all samples shall be available to the Engineer within 24 hours of delivering the samples to the laboratory. The Contractor shall ensure that the laboratory responsible for the analysis of the samples has been properly certified by the California Department of Health Services for conducting the analyses described under these special provisions.

Monitoring of the chemical precipitation or ion exchange treatment systems shall be in conformance with permits obtained by the treatment system operator and the Department.

SPILL CONTINGENCY

The Contractor shall prepare and submit to the Engineer a contingency plan for the management of spills or leaks of any materials or wastes that may impact the water quality of the Carquinez Strait.

The spill contingency plan shall be incorporated within the Storm Water Pollution Prevention Plan (SWPPP), as specified in "Water Pollution Control" of these special provisions.

The contingency plan shall include instructions and procedures for reporting spills, and a list of spill containment and collection materials and equipment to be maintained onsite. The contingency plan shall be reviewed and updated at least every 90 calendar days.

LIQUIDS, RESIDUES AND DEBRIS

The Contractor shall prevent the discharge of slurries, liquids, residues, or debris produced during the work to storm water facilities or surface waters of the State. The SWPPP shall, at a minimum, depict and describe the procedural and structural methods of detaining, collecting, and disposing of all slurries, liquids, residues, and debris associated with the operations. Sufficient redundancy shall be incorporated into the procedural and structural methods such that the slurries, liquids, residues, and debris are not conveyed into or become present in drainage systems, San Francisco Bay, or other water bodies.

MEASUREMENT AND PAYMENT

The contract lump sum price paid for non-storm water discharges shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in non-storm water discharges, complete in place, as shown on the plans, as specified in the Standard Specifications, and these special provisions, and as directed by the Engineer.

10-1.12 COOPERATION

Attention is directed to Sections 7-1.14, "Cooperation," and 8-1.10, "Utility and Non-Highway Facilities," of the Standard Specifications and these special provisions.

In the event of a loss caused to the Contractor due to unnecessary delays or failure to finish the work within the time specified for completion caused by another contractor under contract with the Department performing work for the State, the State will reimburse the delayed Contractor in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications. Deductions will be made from any moneys due or that may become due the contractor causing the loss or delay.

It is anticipated that work will be in progress by State forces and other contractors within or adjacent to the project limits of this contract.

Contracts which may be in progress during the working period of this contract include but are not necessarily limited to the following:

Contract No. 04-006064

Contract No. 04-006054

Contract No. 04-006034

Progress schedules for other work in progress, if available, may be inspected by the Contractor upon approval by the Engineer. Such progress schedules are tentative and cannot be guaranteed accurate.

The Contractor shall attend joint weekly meetings, to be organized by the Engineer with other contractors on adjacent projects, in order to minimize potential conflicts. The Contractor shall coordinate with and accommodate other bridge contractors when preparing operations and work schedules.

10-1.13 SPAN 17 COOPERATION

Cooperation with the contractor constructing Contract, 04- 006064, Bridge Nos. 23-0212G and 23-0215R, will be required in Span 17.

The Contractor shall be responsible for coordinating his construction schedule for the construction of the Span 17 hinge with the contractor constructing Contract 04-006064.

The prestressing materials on the upper hinge anchored to the long span side of the hinge in Span 17 (Contract 04-006064, Bridge No's 23-0212G and 23-0215R) will be furnished as a part of Contract 04-006064. All prestressing systems which physically pass out of the concrete diaphragm on the long span side of the hinge at the contract limits and into this contract will be furnished as a part of Contract 04-006064. The work of stressing bars that secure the upper seat at the diaphragm and the shear key will be performed as a part of this contract and shall be coordinated with Contract 04-006064 Contractor's prestressing subcontractor. All bar reinforcing within the hinge will be furnished and installed in this contract, except as noted otherwise in these special provisions or on the drawings. All bar reinforcing which physically passes out of the concrete diaphragm on the long span side of the hinge at the contract limits and which enters this contract will be installed as a part of Contract 04-006064 by that Contractor. Removal of the forms and cleaning of the face of the diaphragm on the long span side of the hinge shall be performed as a part of this contract.

Deck grinding in Span 17 across the hinge and 15 meters into Contract 04-006064 as necessary to install the joint seal assembly shall be considered a part of this contract. The Contractor shall coordinate and furnish all necessary materials and install any temporary bridging required to allow grinding across the joint blockout prior to the installation of the joint.

Payment

Full compensation for cooperating with the contractor constructing Contract 04-006064, for, prestressing the upper seat of the hinge (with materials supplied by the Contract 04-006064) in Span 17, for grinding 15m into Contract 04-006064, and for any temporary bridging required to grind across the joint shall be considered as included in the various items of work involved and no additional compensation will be allowed therefor.

10-1.14 CONSTRUCTION SURVEYING (NEW BRIDGE ONLY)

This work shall consist of construction surveying by the Contractor using Global Positioning Systems (GPS) surveying methods, including, Real-timekinematic (RTK) GPS as well as conventional surveying means to establish the lines and grades required for completion of the bridge work as shown on the plans and as specified in the Standard Specifications.

Except as otherwise provided herein for establishment of Project horizontal and vertical control and right-of-way staking (on land only) by the Engineer, all other specifications, including the first two paragraphs of Section 5-1.07, "Lines and Grade," of the Standard Specifications, which require the establishment of lines and grades by the Engineer, shall not apply to this contract.

The Engineer will provide survey control, both vertical and horizontal, including B-order monumentation (using California Coordinate System 1927, Zone 2 coordinates) at both the North and South ends of the bridge. The Engineer will also provide a control diagram for the monumentation (a Record of Survey depicting the Project Control Survey). Vertical Datum or benchmarks will also be provided. The Contractor's attention is directed to the third paragraph of Section 5-1.07, "Lines and Grade," of the Standard Specifications with regard to preserving control monuments furnished by the State.

The Contractor shall use GPS combined with software specifically designed for precise positioning of large structures for positioning of the piling templates and for driving of the permanent steel casings for the water piers. The software shall provide a visual display on a computer screen that allows the viewer to see real-time three-dimensional coordinates, attitude and orientation information with regard to a predetermined target position. The Engineer shall be provided access to the location where the computer monitor is located whenever the system is being used to maneuver and set piling or templates into place. The software shall also have user-defined reporting functions for quality control and as-built reporting.

Before starting any construction survey work, the Contractor shall submit in writing for approval by the Engineer, the proposed procedures, methods, equipment, and typical stake markings to be used for all Contractor surveying on the project. All procedures, methods and typical state markings shall be in accordance with Chapter 12, "Construction Surveys", of the Department of Transportation publication titled "Survey Manual." The Contractor's attention is also directed to the requirements for the "Geometry Control Plan" and the "Geometry Control Manual" for the construction of the segmental superstructure, elsewhere in these special provisions, which also require survey methods and procedures to be submitted. The segmental superstructure surveying submittals need not be considered in the above submittal.

Construction surveying shall be performed as necessary to control the work and with accuracy to assure that the completed work conforms to the lines, grades and sections shown on the plans.

When the project needs the right-of-way marked for clearing and grubbing, the Engineer will set monuments to control the right-of-way lines (on land). The Contractor shall notify the Engineer of the need for right-of-way control monuments at least 5 working days in advance of starting operations that require right-of-way monumentation..

The Contractor shall make all computations necessary to establish the exact position of the work from the Project control points. All computations, survey notes, and other records necessary to accomplish the work shall be neat, legible, and accurate. Copies of such computations, notes, and other records shall be furnished to the Engineer prior to beginning work that requires their use. Upon completion of all construction surveying and prior to acceptance of the contract, all computations, survey notes, and other data used to accomplish the work shall be furnished to the Engineer and shall become the property of the State.

The Contractor shall submit, for approval by the Engineer, a schedule of values detailing the cost breakdown of the contract lump sum item for construction surveying. The schedule of values shall reflect the items, work, quantities and costs required to do all the surveying required by these special provisions, including surveying for geometry control during cantilever construction. The Contractor shall be responsible for the accuracy of the quantities and costs used in the schedule of values submitted for approval.

The sum of the amounts for the items and work listed in the schedule of values shall be equal to the contract lump sum price for construction surveying. Changes in the schedule of values, due to changes by the Contractor in the items and work listed, shall not result in a change in the contract lump sum price for construction surveying.

The schedule of values for construction surveying shall be submitted to the Engineer within the time required for submittal of the Interim Baseline Schedule, as specified in "Progress Schedule (Critical Path)" of these special provisions. The items and work listed in the schedule of values shall be designated in the resource loading required in the Baseline Schedule required in "Progress Schedule (Critical Path)" of these special provisions.

When approved in writing by the Engineer, the schedule of values will be used only to determine progress payments for construction surveying during the progress of the work. No partial payment for construction surveying will be made until the schedule of values is approved in writing by the Engineer.

Payment

The contract lump sum price paid for construction surveying shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the required survey work involved in constructing the new bridge, including surveying for geometry control as specified in the these special provisions, and as directed by the Engineer.

10-1.15 PROGRESS SCHEDULE (CRITICAL PATH)

Progress schedules will be required for this contract. Progress schedules shall utilize the Critical Path Method (CPM). Attention is directed to "Cooperation," and "Obstructions" of these special provisions. Nothing in theses special provisions shall be construed as relieving the Contractor from the responsibilities specified in Section 7, "Legal Relations and Responsibility," of the Standard Specifications.

DEFINITIONS

The following definitions apply to this section "Progress Schedule (Critical Path)":

- A. Activity: Any task, or portion of a project, which takes time to complete.
- B. Baseline Schedule: The initial CPM schedule representing the Contractor's original work plan, as accepted by the Engineer.
- C. Controlling Operation: The activity considered at the time by the Engineer, within that series of activities defined as the critical path, which if delayed or prolonged, will delay the time of completion of the contract.
- D. Critical Path: The series of activities, which determines the earliest completion of the contract (Forecast Completion Date). This is the longest path of activities having the least amount of float.
- E. Critical Path Method: A mathematical calculation to determine the earliest completion of the contract represented by a graphic representation of the sequence of activities that shows the interrelationships and interdependencies of the elements composing a project.
- F. Current Contract Completion Date: The extended date for completion of the contract shown on the weekly statement of working days furnished by the Engineer in accordance with Section 8-1.06, "Time of Completion," of the Standard Specifications.
- G. Early Completion Time: The difference in time between the current contract completion date and the Contractor's scheduled early forecast completion date as shown on the accepted baseline schedule, or schedule updates and revisions.

- H. Float: The amount of time between the early start date and the late start date, or the early finish date and the late finish date, of any activity or group of activities in the network.
- I. Forecast Completion Date: The completion date of the last scheduled work activity identified on the critical path.
- J. Fragnet: A section or fragment of the network diagram comprised of a group of activities.
- K. Free Float: The amount of time an activity can be delayed before affecting a subsequent activity.
- L. Hammock Activity: An activity added to the network to span an existing group of activities for summarizing purposes.
- M. Milestone: A marker in a network, which is typically used to mark a point in time or denote the beginning or end of a sequence of activities. A milestone has zero duration, but will otherwise function in the network as if it were an activity.
- N. Revision: A change in the future portion of the schedule that modifies logic, adds or deletes activities, or alters activities, sequences, or durations.
- O. Tabular Listing: A report showing schedule activities, their relationships, durations, scheduled and actual dates, and float.
- P. Total Float: The amount of time that an activity may be delayed without affecting the total project duration of the critical path.
- Q. Update: The modification of the CPM progress schedule through a regular review to incorporate actual progress to date by activity, approved time adjustments, and projected completion dates.
- R. Time Scaled Logic Diagram: A schematic display of the logical relationships of project activities, drawn from left to right to reflect project chronology with the positioning and length of the activity representing its duration.
- S. Bar Chart (Gantt Chart): A graphic display of scheduled-related information, activities or other project elements are listed down the left side of the chart, dates are shown across the top, and activity durations are shown as date-placed horizontal bars.

PRECONSTRUCTION SCHEDULING CONFERENCE

The Engineer shall schedule and conduct a Preconstruction Scheduling Conference with the Contractor's Project Manager and Construction Scheduler within seven days after the bidder has received the contract for execution. At this meeting, the requirements of this section of the special provisions will be reviewed with the Contractor. The Contractor shall be prepared to discuss its schedule methodology, proposed sequence of operations, the activity identification system for labeling all work activities, the schedule file numbering system, and any deviations it proposes to make from the Stage Construction Plans. The Engineer shall submit a diskette of a scheduling shell project, displaying an activity code dictionary consisting of fields populated with the Caltrans Scope Breakdown Structure (SBS) Code. The SBS structure will be finalized after submittal of the accepted Baseline schedule. The Contractor shall utilize these codes, and may add other codes as necessary, to group and organize the work activities. Periodically the Engineer may request the Contractor to utilize additional filters, layouts or activity codes to be able to further group or summarize work activities.

Also, the Engineer and the Contractor shall review the requirements for all submittals applicable to the contract and discuss their respective preparation and review durations. All submittals and reviews are to be reflected on the Interim Baseline Schedule and the Baseline Schedule.

INTERIM BASELINE SCHEDULE

Within 15 days after approval of the contract, the Contractor shall submit to the Engineer an Interim Baseline Project Schedule which will serve as the progress schedule for the first 120 days of the project, or until the Baseline Schedule is accepted, whichever is sooner. The Interim Baseline Schedule shall utilize the critical path method. The Interim Baseline Schedule shall depict how the Contractor plans to perform the work for the first 120 days of the contract. Additionally, the Interim Baseline Schedule shall show all submittals required early in the project, and shall provide for all permits, and other non-work activities necessary to begin the work. The Interim Baseline Schedule submittal shall include a 3 1/2 inch floppy diskette which contains the data files used to generate the schedule.

The Engineer shall be allowed 10 days to review the schedule and to provide comments, including the Contractor's application of the supplied scope breakdown structure. The Interim Baseline Schedule does not require Caltrans acceptance but all comments are to be implemented into the Baseline Schedule. Re-submittal of the Interim Baseline Schedule is not required. Late review of the Interim Baseline Schedule shall not restrain the submittal of the Baseline Schedule.

BASELINE SCHEDULE

Within 30 days, after approval of the contract, the Contractor shall submit to the Engineer a Baseline Project Schedule including the incorporation of all comments provided to the Interim Baseline Schedule. The Baseline Schedule shall have a data date of the day prior to the first working day of the contract. The schedule shall not include any actual start dates, actual finish dates, or constraint dates (except for Contract Milestone dates.) The Baseline Schedule shall meet interim milestone

dates, contract milestone dates, stage construction requirements, internal time constraints, show logical sequence of activities, and must not extend beyond the number of days originally provided for in the contract.

All task activities shall be assigned to a project calendar. Each calendar shall identify a workweek, and holidays. Use different calendars for work activities that occur on different work schedules. Activities for the preparation and the review of submittals plus fabrication are to be assigned to the same calendar.

The Contractor shall not add job inefficiencies or weather days to a project calendar without prior approval by the Engineer.

The Contractor shall not assign negative lags to any activities.

The Baseline CPM Schedule submitted by the Contractor shall have a sufficient number of activities to assure adequate planning of the project and to permit monitoring and evaluation of progress and the analysis of time impacts. The Baseline Schedule shall depict how the Contractor plans to complete the whole work involved, and shall show all activities that define the critical path. Each activity shall have durations of not more than 20 working days, and not less than one working day unless permitted otherwise by the Engineer. All activities in the schedule, with the exception of the first and last activities, shall have a minimum of one predecessor and a minimum of one successor.

The Baseline CPM Schedule submitted by the Contractor shall show the sequence in which individual spans or cantilevers are constructed and made continuous. In addition, the following specific activities related to segmental cast-in-place construction shall be included:

- A. Required shop drawing reviews;
- B. Form traveler fabrication;
- C. Erection equipment fabrication;
- D. Form traveler assembly;
- E. Erection equipment assembly;
- F. Pier Casting;
- G. Form traveler erection and assembly on pier table;
- H. Moving from travelers;
- I. Disassembly and removal of form travelers.

The Contractor's attention is directed to the requirements for submitting cost reduction incentive proposals elsewhere in these Special Provisions.

The Baseline Schedule shall not attribute negative float to any activity. Float shall not be considered as time for the exclusive use of or benefit of either the State or the Contractor but shall be considered as a jointly owned, expiring resource available to the project and shall not be used to the financial detriment of either party. Any accepted schedule, revision or update having an early completion date shall show the time between the early completion date and the current Contract Completion Date as "total float".

The Contractor shall be responsible for assuring that all work sequences are logical and the network shows a coordinated plan for complete performance of the work. Failure of the Contractor to include any element of work required for the performance of the contract in the network shall not relieve the Contractor from completing all work within the time limit specified for completion of the contract. If the Contractor fails to define any element of work, activity or logic, the Contractor in the next monthly update or revision of the schedule shall correct it.

The Baseline Schedule shall be supplemented with resource allocations for every task activity to a level of detail that facilitates report generation based on labor craft and equipment class for the Contractor and subcontractors. The Contractor shall use average composite crews to display the labor loading of on-site construction activities. On the P3 resource dictionary, each resource should have the normal and maximum limits for the specified period of time. Based on the resource limits, the Contractor shall optimize and level labor to reflect a reasonable plan for accomplishing the work of the contract and to assure that resources are not duplicated in concurrent activities. Along with the baseline progress schedule, the Contractor shall also submit to the Engineer time-scaled resource histograms of the labor crafts and equipment classes to be utilized on the contract.

The Contractor shall not create hammock activities for the purpose of resources loading.

The Contractor shall require each subcontractor to submit in writing a statement certifying that the subcontractor has concurred with the Contractor's CPM, including major updates, and that the subcontractor's related schedule has been incorporated accurately, including the duration of activities, labor and equipment loading. Should the Baseline Schedule or schedule update, submitted for acceptance, show variances from the requirements of the contract, the Contractor shall make specific mention of the variations in the letter of transmittal, in order that, if accepted, proper adjustments to the project schedule can be made. The Contractor will not be relieved of the responsibility for executing the work in strict accordance with the requirements of the contract documents. In the event of a conflict between the requirements of the contract documents and the information provided or shown on an accepted schedule, the requirements of the contract documents shall take precedence.

Each schedule submitted to the Engineer shall comply with all limits imposed by the contract, with all specified intermediate milestone and contract completion dates, and with all constraints, restraints or sequences included in the contract. The degree of detail shall include factors including, but not limited to:

- A. Physical breakdown of the project;
- B. Contract milestones and completion dates, substantial completion dates, constraints, restraints, sequences of work shown in the contract, the planned substantial completion date, and the final completion date;
- C. Type of work to be performed, the sequences, and the major subcontractors involved;
- D. All purchases, submittals, submittal reviews, manufacture, fabrication, tests, delivery, and installation activities for all major materials and equipment, including submittal of requests for audits of manufacturers and fabricators in conformance with "Manufacturing and Fabrication Qualification Audit for Materials" of these special provisions;
- E. Preparation, submittal and approval of shop and working drawings and material samples, showing time, as specified elsewhere, for the Engineer's review. The same time frame shall be allowed for at least one resubmittal on all major submittals so identified in the contract documents;
- F. Identification of interfaces and dependencies with preceding, concurrent and follow-on contractors, railroads, and utilities as shown on the plans or specified in the specifications;
- G. Identification of each and every utility relocation and interface as a separate activity, including activity description and responsibility coding that identifies the type of utility and the name of the utility company involved;
- H. Actual tests, submission of test reports, and approval of test results;
- I. All start-up, testing, training, and assistance required under the Contract;
- J. Punchlist and final clean-up;
- K. Identification of any manpower, material, or equipment restrictions, as well as any activity requiring unusual shift work, such as double shifts, 6-day weeks, specified overtime, or work at times other than regular days or hours;
- L. Identification of each and every ramp closing and opening event as a separate one-day activity, including designation by activity coding and description that it is a north-bound, south-bound, east-bound, west-bound, and entry or exit ramp activity;
- M. Separate resources graphs for the Contract's labor, equipment and critical path labor, with an accompanying analysis of each and explanation for any variances (i.e., example front-end resource loading of schedules); and
- N. Equipment and labor shall be differentiated by a cost account code within the resource dictionary.

The Baseline Schedule submittal shall include a 3 1/2 inch floppy diskette which contains the data files used to generate the schedule, a schedule narrative describing the critical path, narratives providing additional schedule detail as requested by the Engineer and all schedule reports.

The Engineer shall be allowed 15 days to review and accept or reject the baseline project schedule submitted. Rejected schedules shall be resubmitted to the Engineer within 5 days, at which time a new 15 day review period by the Engineer will begin.

PROJECT SCHEDULE REPORTS

Schedules submitted to the Engineer including Interim Baseline, Baseline, and update schedules shall include time scaled network diagrams in a layout format requested by the Engineer. The network diagrams submitted to the Engineer shall also be accompanied by four computer-generated mathematical analysis tabular reports for each activity included in the project schedule. The reports (8 1/2" x 11" size) shall include a network diagram report showing the activity columns only, a predecessor and successor report, a resource report (Interim Baseline and Baseline Schedules), and a scheduling and leveling calculation report. The network diagram reports shall include, at a minimum, the following for each activity:

- A. Activity number and description;
- B. Activity codes;
- C. Original, actual and remaining durations;
- D. Early start date (by calendar date);
- E. Early finish date (by calendar date);
- F. Actual start date (by calendar date);
- G. Actual finish date (by calendar date);
- H. Late start date (by calendar date);
- I. Late finish date (by calendar date);
- J. Identify activity calendar ID;
- K. Total Float and Free Float, in work days; and
- L. Percentage complete.

Network diagrams shall be sorted and grouped in a format requested by the Engineer reflecting the project breakdown per the Caltrans scope breakdown structure codes. They shall show a continuous flow of information from left to right per the project sorting and grouping codes. E.g., project milestones, submittals sub-grouped by description, and the construction activities sub-grouped by the scope breakdown structure. The primary paths of criticality shall be clearly and graphically identified on the networks. The network diagram shall be prepared on E-size sheets (36" x 48"), shall have a title block in the lower right-hand corner, and a timeline on each page. Exceptions to the size of the network sheets and the use of computer graphics to generate the networks shall be subject to the approval of the Engineer.

Schedule network diagrams the tabular reports shall be submitted to the Engineer for acceptance in the following quantities:

- A. 2 sets of the Network Diagrams;
- B. 2 copies of the tabular reports (8 1/2" x 11" size); and
- C. 3 computer diskettes.

WEEKLY SCHEDULE MEETINGS

The Engineer and the Contractor shall hold weekly scheduling meetings to discuss the near term schedule activities, to address any long-term schedule issues, and to discuss any relevant technical issues. The Contractor shall develop a rolling 4-week schedule identifying the previous week worked and a 3-week look ahead. It shall provide sufficient detail to include the actual and planned activities of the Contractor and all the subcontractors for offsite and construction activities, addressing all activities to be performed and to identify issues requiring engineering action or input.

Each activity in the 4 week rolling schedule shall be identified by an associated CPM schedule activity ID numbering system. This schedule should not be hand written. To create the 4 weeks rolling schedules, the Contractor shall utilize Primavera Project Planner or other software, as approved by the Engineer. The Engineer will provide the format of the schedule. This schedule shall be electronically submitted to the Engineer one day prior to the scheduled meeting date.

MONTHLY UPDATE SCHEDULES

The Contractor shall submit a Monthly Update Schedule to the Engineer once in each month within 5 days of the data date. The proposed update schedule prepared by the Contractor shall include all information available as of the 20th calendar day of the month, or other data date as established by the Engineer. A detailed list of all proposed schedule changes such as logic, duration, lead/lag, forecast completion date, additions and deletions shall be submitted with the update.

The monthly update of the schedule shall focus on the period from the last update to the current cut-off data date. Changes to activities or logic beyond the data date are classified as revisions and need to be addressed per the schedule revision section of this specification. Activities that have either started or finished shall be reported as they actually occurred and designated as complete, if actually completed. For activities in progress that are forecasted to complete longer than planned, the remaining durations shall be revised, not the original durations. All out of sequence activities are to be reviewed and their relationships either verified or changed.

The Monthly Update Schedule submitted to the Engineer shall be accompanied by a Schedule Narrative Report. The report shall describe the physical progress during the report period, plans for continuing the work during the forthcoming report period, actions planned to correct any negative float, and an explanation of potential delays or problems and their estimated impact on performance, milestone completion dates, forecast completion date, and the overall project completion date. In addition, alternatives for possible schedule recovery to mitigate any potential delay or cost increases shall be included for consideration by the Engineer. The report shall follow the outline set forth below:

Contractor's Schedule Narrative Report Outline:

- A. Contractor's Transmittal Letter;
- B. Work completed during the period;
- C. Description of the current critical path;
- D. Description of current problem areas;
- E. Current and anticipated delays;
 - 1. Cause of the delay;
 - 2. Corrective action and schedule adjustments to correct the delay; and
 - 3. Impact of the delay on other activities, milestones, and completion dates;
- F. Changes in construction sequences;
- G. Pending items and status thereof;
 - 1. Permits;
 - 2. Change Orders;
 - 3. Time Extensions; and
 - 4. Non-Compliance Notices;

- H. Contract completion date(s) status;
 - 1. Ahead of schedule and number of days; and
 - 2. Behind schedule and number of days; and
- I. Include updated Network Diagram and Reports.

The Contractor shall provide to the Engineer a 3 1/2" electronic disk of the schedule, together with printed copies of the network diagrams and tabular reports described under "Project Schedule Reports", and the Schedule Narrative Report.

Portions of the network diagram on which all activities are complete need not be reprinted and submitted in subsequent updates. However, the electronic disk file of the submitted schedule and the related reports shall constitute a clear record of progress of the work from award of contract to final completion.

On a date determined by the Engineer, the Contractor shall meet with the Engineer to review the monthly schedule update. At the monthly progress meeting, the Contractor and the Engineer shall review the updated schedule and shall discuss the content of the Narrative Report. The Engineer shall be allowed 10 days after the meeting to review and accept or reject the update schedule submitted. Rejected schedules shall be resubmitted to the Engineer within 5 days, at which time a new 5 day review period by the Engineer will begin. All efforts shall be made between the Engineer and the Contractor to complete the review and the acceptance process prior to the next update schedule data date. To expedite the process a second meeting between the Engineer and the Contractor shall be held.

SCHEDULE REVISIONS

If the Contractor desires to make a change to the accepted schedule, the Contractor shall request permission from the Engineer in writing, stating the reasons for the change, and proposed revisions to activities, logic and duration. The Contractor shall submit for acceptance an analysis showing the effect of the revisions on the entire project. The analysis shall include:

- A. An updated schedule not including the revisions. The schedule shall have a data date just prior to implementing the proposed revisions and includes a project completion date;
- B. A revised schedule that includes the proposed revisions. The schedule will have the same data date as the updated schedule and include a project completion date;
- C. The Contractor should add resources for all new activities, also adjust resources for those activities that their remaining duration were changed;
- D. A narrative explanation of the revisions and their impact to the schedule; and
- E. Computer files of the updated schedule and the revised schedule sequentially numbered or renamed for archive (record) purposes.

The Engineer will provide a response within 10 days. No revision to the accepted baseline schedule or the schedule updates shall be made without the prior written approval of the Engineer.

The Engineer will request the Contractor to submit a proposed revised schedule within 15 days when:

- A. there is a significant change in the Contractor's operations that will affect the critical path;
- B. the current updated schedule indicates that the contract progress is 4 weeks or more behind the planned schedule, as determined by the Engineer; or
- C. the Engineer determines that an approved or anticipated change will impact the critical path, milestone or completion dates, contract progress, or work by other contractors.

The Engineer shall be allowed 10 days to review and accept or reject a schedule revision. Rejected schedule revisions shall be revised and resubmitted to the Engineer within 10 days, at which time a new 10 day review period by the Engineer will begin. Only upon approval of a change by the Engineer shall it be reflected in the next schedule update submitted by the Contractor.

SCHEDULE TIME EXTENSION REQUESTS

When the Contractor requests a time extension due to contract change orders or delays, the Contractor shall submit to the Engineer a written Time Impact Analysis illustrating the influence of each change or delay on the current contract completion date or milestone completion date, utilizing the current accepted schedule. Each Time Impact Analysis shall include a schedule update and schedule revision, both with the same data dates, demonstrating how the Contractor proposes to incorporate the Change Order or delay into the current schedule. The schedule revision shall include the sequence of activities and any revisions to the existing activities to demonstrate the influence of the delay, the proposed method for incorporating the delay, and its impact into the schedule.

Each Time Impact Analysis shall demonstrate the estimated time impact based on the events of delay, the anticipated or actual date of the contract change order work performance, the status of construction at that point in time, and the event time computation of all activities affected by the change or delay. The event times used in the analysis shall be those included in the latest update of the current schedule in effect at the time the change or delay was encountered.

Time extensions will be granted only to the extent that equitable time adjustments for the activity or activities affected exceed the total or remaining float along the critical path of activities at the time of actual delay, or at the time the contract change order work is performed. Float time is not for the exclusive use or benefit of the Engineer or the Contractor, but is an expiring resource available to all parties as needed to meet contract milestones and the contract completion date. Time extensions will not be granted nor will delay damages be paid unless:

- A. the delay is beyond the control and without the fault or negligence of the Contractor and its subcontractors or suppliers, at any tier; and
- B. the delay extends the actual performance of the work beyond the applicable current contract completion date and the most recent date predicted for completion of the project on the accepted schedule update current as of the time of the delay or as of the time of issuance of the contract change order.

Time Impact Analyses shall be submitted in triplicate within 15 days after the delay occurs or after issuance of the contract change order. A schedule file diskette is also to be submitted.

Acceptance or rejection of each Time Impact Analysis by the Engineer will be made within 15 days after receipt of the Time Impact Analysis, unless subsequent meetings and negotiations delay the review. A copy of the Time Impact Analysis accepted by the Engineer shall be returned to the Contractor and the accepted schedule revisions illustrating the influence of the contract change orders or delays shall be incorporated into the project schedule during the first update after acceptance.

FINAL SCHEDULE UPDATE

Within 15 days after the acceptance of the contract by the Director, the Contractor shall submit a final update of the schedule with actual start and actual finish dates for all activities. This schedule submission shall be accompanied by a certification, signed by an officer of the company and the Contractor's Project Manager stating "To the best of my knowledge, the enclosed final update of the project schedule reflects the actual start and completion dates of the activities contained herein."

EQUIPMENT AND SOFTWARE

The Contractor shall provide for the State's exclusive possession and use a complete computer system specifically capable of creating, storing, updating and producing CPM schedules. Before delivery and setup of the computer system, the Contractor shall submit to the Engineer for approval a detailed list of all computer hardware and software the Contractor proposes to furnish. The minimum computer system to be furnished shall include the following:

- A. Complete computer system, including keyboard, mouse, 21 inch color SVGA monitor (1024x768 pixels), Intel Pentium III 850 MHz microprocessor chip, or equivalent;
- B. Computer operating system software, compatible with the selected processing unit, for NT4.0 or later or equivalent;
- C. Minimum one-twenty-eight (128) megabytes of random access memory (RAM);
- D. A 6.4 gigabytes minimum hard disk drive, a 1.44 megabyte 3 1/2 inch floppy disk drive, 32x speed minimum CD-ROM drive, Ethernet card and 56k modem;
- E. A color-ink-jet plotter with a minimum 32 megabyte RAM, capable of 600 dots per inch color, 1200 dots per inch monochrome, or equivalent, capable of printing fully legible, time scaled charts, and network diagrams, in four colors, with a minimum size of 36 inches by 48 inches (E size) and is compatible with the selected system, an HP Design Jet 1055 CM or equivalent, plotter stand, roll paper assembly and automatic paper cutter, and provide plotter paper and ink cartridges throughout the contract;
- F. CPM software shall be Primavera Project Planner, the latest version for Windows 95, or later;
- G. Scheduler Analyzer Pro or equivalent (a suite of programs to assist in schedule analysis) in the latest version for Windows 95, Windows NT or later; and
- H. Microsoft Office Software, the latest version for Windows 95, Windows NT or later and McAfee Virus software or equivalent.

The computer hardware and software furnished shall be compatible with that used by the Contractor for the production of the CPM progress schedule required by the Contract, and shall include original instruction manuals and other documentation normally provided with the software.

The Contractor shall furnish, install, set up, maintain and repair the computer hardware and software ready for use at a location determined by the Engineer. The hardware and software shall be installed and ready for use by the first submission

of the baseline schedule. The Contractor shall provide 24 hours of formal training for the Engineer, and three other agents of the department designated by the Engineer, in the use of the hardware and software to include schedule analysis, reporting, and resource and cost allocations. An authorized vendor of Primavera Project Planner shall perform the training.

All computer hardware and software furnished shall remain the property of the Contractor and shall be removed by the Contractor upon acceptance of the contract when no claims involving contract progress are pending. When claims involving contract progress are pending, computer hardware or software shall not be removed until the final estimate has been submitted to the Contractor.

PAYMENT

Progress schedule (critical path) will be paid for at a lump sum price. The contract lump sum price paid for progress schedule (critical path) shall include full compensation for furnishing all labor, materials (including computer hardware and software), tools, equipment, and incidentals; and for doing all the work involved in preparing, furnishing, updating and revising CPM progress schedules. Also for maintaining and repairing the computer hardware and training the Engineer in the use of the computer hardware and software as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Payments for progress schedule (critical path) will be made as follows:

- A. Interim baseline schedule accepted, then 10 percent payment for progress schedule (critical path) will be made.
- B. Baseline schedule accepted, then 10 percent payment for progress schedule (critical path) will be made.
- C. Monthly update schedules accepted, then 75 percent payment for progress schedule (critical path) will be made equally for each update.
- D. Final schedule update accepted, then 5 percent payment for progress schedule (critical path) will be made.

The Department will retain an amount equal to 25 percent of the estimated value of the work performed during the first estimate period in which the Contractor fails to submit an interim baseline, baseline, revised or updated CPM schedule conforming to the requirements of this section, as determined by the Engineer. Thereafter, on subsequent successive estimate periods the percentage the Department will retain will be increased at the rate of 25 percent per estimate period in which acceptable CPM progress schedules have not been submitted to the Engineer. Retention's for failure to submit acceptable CPM progress schedules shall be additional to all other retention's provided for in the contract. The retention for failure to submit acceptable CPM progress schedules will be released for payment on the next monthly estimate for partial payment following the date that acceptable CPM progress schedules are submitted to the Engineer.

The adjustment provisions in Section 4-1.03, "Changes," of the Standard Specifications, shall not apply to the item of progress schedule (critical path). Adjustments in compensation for the project schedule will not be made for any increased or decreased work ordered by the Engineer in furnishing project schedules.

10-1.16 WORKING DRAWING LIST, SCHEDULE AND SUBMITTAL

Using the progress schedule required by these special provisions, the Contractor shall create and submit for review a list of the anticipated working drawings required by these special provisions and the Standard Specifications. The list shall show the name of the working drawing, the anticipated date for submittal of the working drawing, the reference section of the special provisions or the standard specifications requiring the working drawing and the allowable time for review of the working drawings by the State, as required by these special provisions or the Standard Specifications.

The Contractor shall submit the working drawing list and schedule to the Engineer for review with the baseline progress schedule.

All working drawing submittals shall be submitted in accordance with the Contractor's approved working drawing schedule. When submittals or re-submittals are not received in accordance with the approved schedule, they shall be downgraded in review priority and reviews conducted according to the approved schedule. Modifications and/or revisions to the approved schedule (and the resulting re-prioritizing of submittals) shall be submitted for review in accordance with "Progress Schedule (Critical Path)" of these special provisions.

Payment

Full compensation for preparing and submitting the working drawing list and schedule, including all necessary revisions, shall be considered as included in the contract price paid for Progress Schedule (Critical Path), and no additional compensation will be allowed therefor.

10-1.17 OBSTRUCTIONS

Attention is directed to Section 8-1.10, "Utility and Non-Highway Facilities," and Section 15, "Existing Highway Facilities," of the Standard Specifications and these special provisions.

Attention is directed to the existence of certain underground facilities that may require special precautions be taken by the Contractor to protect the health, safety and welfare of workers and of the public. Facilities requiring special precautions include, but are not limited to: conductors of petroleum products, oxygen, chlorine, and toxic or flammable gases; natural gas in pipelines greater than 150 mm in diameter or pipelines operating at pressures greater than 415 kPa (gage); underground electric supply system conductors or cables, with potential to ground of more than 300 V, either directly buried or in a duct or conduit which do not have concentric grounded or other effectively grounded metal shields or sheaths.

The Contractor shall notify the Engineer and the appropriate regional notification center for operators of subsurface installations at least 2 working days, but not more than 14 calendar days, prior to performing any excavation or other work close to any underground pipeline, conduit, duct, wire or other structure. Regional notification centers include, but are not limited to, the following:

Notification Center	Telephone Number
Underground Service Alert-Northern California (USA)	1-800-642-2444 1-800-227-2600
Underground Service Alert-Southern California (USA)	1-800-422-4133 1-800-227-2600

The Contractor's attention is directed the Rhodia sampling wells located in the vicinity of Span 5. These sampling wells shall be protected in-place.

The Contractor's attention is directed to the "Materials Handout" regarding the report of the remnants of existing timber wharfs extending from the southern shore into the Carquinez Straight both east and west of the new alignment. The Materials Handout will be made available at the Department of Transportation, Plans and Bid Documents, Room 0200, Transportation Building, 1120 N Street, P.O. Box 942874, Sacramento, California 94274-0001, Telephone No. (916) 654-4490.

If these facilities are not located on the plans in both alignment and elevation, no work shall be performed in the vicinity of the facilities, except as provided herein for conduit to be placed under pavement, until the owner, or the owner's representative, has located the facility by potholing, probing or other means that will locate and identify the facility. Conduit to be installed under pavement in the vicinity of these facilities shall be placed by the trenching method in conformance with the provisions in "Conduit" of these special provisions. If, in the opinion of the Engineer, the Contractor's operations are delayed or interfered with by reason of the utility facilities not being located by the owner or the owner's representative, the State will compensate the Contractor for the delays to the extent provided in Section 8-1.09, "Right of Way Delays," of the Standard Specifications, and not otherwise, except as provided in Section 8-1.10, "Utility and Non-Highway Facilities," of the Standard Specifications.

The Contractor's attention is directed the 300 mm Rhodia outfall pipe and diffuser structure located in the vicinity of Piers 6 and 7. These facilities shall be protected in-place by the Contractor. The Contractor shall locate and mark with buoys the Rhodia outfall pipe and the diffusers before any work will be allowed in the area of the pipe. A protection plan shall be submitted to the Engineer for approval. The protection plan shall detail methods of locating the pipe and diffusers, placement of buoys, and shall summarize the Contractor's plans to prevent construction equipment from damaging the pipe and diffusers. The Contractor shall coordinate the protection plan with Rhodia prior to submittal to the Engineer for review.

The Contractor shall submit to the Resident Engineer's Office at 757 Arnold Drive, Suite 200

Martinez, California 94553 at telephone number (925) 646-1996, for approval in accordance with the provisions in Section 5-1.02, "Plans and Working Drawings," working drawings of the protection plan. For initial review, 6 sets of such plans, shall be submitted. After review, between 6 and 12 sets, as requested by the Engineer, shall be submitted to the said Office for final approval and for use during construction. The review time to be provided for the Engineer's review of the Contractor's working drawings and calculations for the protection plan, shall be 3 weeks.

Full compensation for locating and marking the Rhodia outfall pipe and diffusers, including removal of markers or buoys at the completion of the bridge construction, shall be considered as included in the contract prices paid for the various items of work shown in the Engineer's Estimate and no additional compensation will be allowed therefor.

10-1.18 MOBILIZATION

Mobilization shall conform to the provisions in Section 11, "Mobilization," of the Standard Specifications and these special provisions.

MARINE ACCESS

The Contractor's establishment of marine access shall conform to the requirements of Section 11, "Mobilization," of the Standard Specifications and these special provisions.

Marine access shall be defined as the mobilization work of furnishing, erecting and removing barges, trestles and other facilities to provide marine access to the job site.

The Contractor's marine access shall not disturb the existing slurry wall that parallels the southern shoreline below and adjacent to the bridge footprint. No excavation or pile driving will be approved in the area of the slurry wall. The Contractor shall take all necessary precautions to locate and protect the slurry wall and shall design his marine access accordingly.

When access trestles are no longer needed, any piles installed by the Contractor for the access trestles shall be extracted and shall become the property of the Contractor and shall be disposed of outside the highway right of way in accordance with the provisions in Section 7-1.13 of the Standard Specifications.

The Contractor may construct access trestles on the both ends of the bridge in accordance with the permits obtained by the State and these special provisions.

The Contractor shall submit to the Resident Engineer's Office at 757 Arnold Drive, Suite 200 Martinez, California 94553 at telephone number (925) 646-1996 in accordance with the provisions in Section 5-1.02, "Plans and Working Drawings," calculations and working drawings of any access trestle(s) that are constructed. Six sets of such plans, manuals and drawings shall be submitted to the said Office for use during construction. The working drawings and calculations shall be signed by a civil engineer registered in the State of California. The access trestles shall also conform to the following requirements:

- A. Piling shall not be creosoted.
- B. The number of piling and the total cross sectional area of the piling shall not exceed the requirements listed in the permits the State has obtained for this project.
- C. Piling used to construct the access trestles shall be completely removed after no longer needed for construction.
- D. The shadow area of the trestles (plan view area) shall not exceed the limits listed in the permits the State has obtained for this project.
- E. Pile driving for the access trestle construction in waters less than 3m deep below MLLW, shall only be allowed during the period of July 1 through October 31.
- F. Superstructure construction of the access trestles shall be achieved by means that do not disturb the mudline except as allowed during the period of July 1 through October 31.

Full compensation for establishing marine access to the job site, including constructing, maintaining and removing access trestles, removing access trestle piles, preparing and submitting calculations and working drawings shall be considered as including in the lump sum price paid for mobilization and no additional compensation will be allowed therefore.

10-1.19 TRANSPORTATION FOR THE ENGINEER

The Contractor shall provide transportation for the Engineer in accordance with Section 5-108, "Inspection," of the Standard Specifications and these special provisions.

The Contractor shall provide, operate, berth and maintain, through out the life of the contract, a commercial grade work boat for the sole use of the Engineer and the Engineer's staff in performance of their work. The boat shall be available for the Engineer's use no later than 30 days after the award of the contract. In addition, the Engineer and all authorized representatives of the State, acting within the scope of their duties in connection with the work under this contract, shall be permitted to ride as passengers, with out charge, on any boat operated by, or for the Contractor for the transportation of personnel, equipment or materials. It is agreed that such transportation will be only on the boats that are making trips in connection with the Contractor's operation.

The commercial grade work boat shall be at minimum, an 11 meter (36 foot) launch adequate for open water operations, such as the Dauntless Class 3612-V Crew Boat by Sea Arc or equal, meeting or exceeding the following minimum requirements:

- A. Drive Power:
 - 1. Twin Diesel engines, minimum of 600 HP, Stern Drive;
 - 2. Fuel capacity shall be adequate for the size of the craft (minimum 1136 liters (300 gal));
 - 3. Minimum cruising speed of 20 knots.
- B. Equipment:
 - 1. All welded aluminum construction;
 - 2. Fender system adequate for site conditions;
 - 3. Mooring bits located forward and aft on boat;
 - 4. Anchor with chain and line (adequate for specific site condition);
 - 5. High patterned inboard side rails;
 - 6. Deep Vee Hull, with variable deadrise;
 - 7. Hull construction using longitudinal framing with heavy-duty transverse support and watertight bulkheads;

8. Heavy duty Bow-Eye reinforcement;
9. 10 to 12 passenger cabin with large windows;
10. Heavy duty lifting and towing eye;
11. External steering capabilities;
12. Heavy-duty rub rails;
13. Tempered safety glass in pilothouse and tinted safety glass in cabin;
14. Insulated pilothouse and cabin;
15. Minimum of 2 high putout bilge pumps;
16. All weather non-skid deck surface.

C Electronics:

1. VHF/FMRadio System;
2. One (1) Com58 or better;
3. Radar system, Furuno 1731 or better;
4. Depth finder, Digital;
5. Compass, Richie navigator, or better, 2 each;
6. Cell/radio phone programmed to the State frequency.

D. Safety & Emergency Equipment (Each Boat):

1. United States Coast Guard required commercial grade safety and emergency equipment;
2. Navigation lights, commercial U.S. Coast Guard Approved;
3. San Francisco Bay Navigation Charts appropriate for the project requirements;
4. United States Coast Guard Approved life jackets for the Contractor's personnel.

The Contractor shall provide mounting facilities to accommodate the cellular phone.

United States Coast Guard-approved life jackets for the Contractor's personnel shall be provided and maintained on the boat at all times, as required by the United States Coast Guard. The Department, at no cost to the Contractor, will provide life jackets for the Department's visitors and representatives .

The Contractor shall provide for the Department's visitors and representatives, safe and protected permanent vertical access, as approved by the Engineer, to all marine construction equipment being utilized for construction of the project.

The Contractor shall provide safety training relative to marine transportation to the State's and the Contractor's personnel, prior to the commencement of work. Training shall include a review of the approved U.S. Coast Guard Safety Manual by all personnel prior to using the Contractor's provided marine transportation. The Contractor shall also conduct a quarterly Marine Safety Workshop for the Department's representatives.

The Contractor shall furnish a licensed boat operator and crew members, as required for the boat's operation and in accordance with all Maritime Agreements and Laws, including, but not limited to, the regulations contained in the Title 46 Code of Federal Regulation Section 16 and Sections 24 through 26. The boat must have a valid U.S. Coast Guard Certificate of Inspection (COI), and must be manned and operated in accordance with the COI. The boat, boat operator, and crew shall be furnished no later than 30 days after the award of the contract for the duration of the contract. The boat, boat operator, and crew shall be furnished for the complete duration of the work on the days when the Contractor's work is in progress and for 10 hours each day, excluding Sundays and legal holidays, and on the days when the Contractor's work is not in progress.

The Contractor shall provide insurance coverage under the Federal Longshoremen's and Harbor Workers Compensation Act, the Jones Act and the Marine Act, with respect to work performed from, or by use of, vehicles on any navigable water of the United States, including liability insurance for watercraft operations. At the option of the Contractor, liability insurance for watercraft operations may be covered under a separate Protection and Indemnity policy, provided the policy contains a combined single limit of at least \$50,000,000 per occurrence and \$50,000,000 aggregate.

The Contractor shall provide berthing facilities at the same location the contractor utilizes for the departure of its construction crew, or at an alternate location approved by the Engineer.

The Contractor shall maintain the boat provided to the Engineer, including daily fueling, routine maintenance, equipment compliance, systems operations and the immediate repair of damage to the boat or its elements. In situations where a boat may be out of service for maintenance in excess of two (2) working days, the contractor shall provide an alternate boat for the exclusive use of the Engineer and the Engineer's staff. In situations where the boat will be out of service for two days or less, transportation with the Contractor will be sufficient.

The boat shall remain the property of the Contractor. The boat shall not be removed from the site of the work until after acceptance of the contract.

The contract lump sum price paid for transportation for the engineer shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in providing transportation for the Engineer as specified herein.

Payment for furnishing the boat, boat operators, and crew, within the first 30 days after the award of the contract and in excess of the complete duration of the work on the days when the Contractor's work is in progress, in excess of 8 hours per day, excluding Sundays and legal holidays on the days when the contractor's work is not in progress, and on Sundays and legal holidays will be paid for as extra work as provided in Section 4-1.03D or the Standard Specifications. No additional payment will be made for furnishing the boat, boat operator and the crew in excess of the time specified herein.

10-1.20 CONSTRUCTION PROJECT INFORMATION SIGNS

Before any major physical construction work readily visible to highway users is started on this contract, the Contractor shall furnish and erect Two Type 2 Construction Project Information signs at the locations designated by the Engineer.

The signs and overlays shall be of a type and material consistent with the estimated time of completion of the project and shall conform to the details shown on the plans.

The sign letters, border and the Department's construction logos shall conform to the colors (non-reflective) and details shown on the plans, and shall be on a white background (non-reflective). The colors blue and orange shall conform to PR Color Number 3 and Number 6, respectively, as specified in the Federal Highway Administration's Color Tolerance Chart.

The sign message to be used for fund types shall consist of the following, in the order shown:

REGIONAL MEASURE ONE

The sign message to be used for type of work shall consist of the following:

BRIDGE CONSTRUCTION

The sign message to be used for the Year of Completion of Project Construction will be furnished by the Engineer. The Contractor shall furnish and install the "Year" sign overlay within 10 working days of notification of the year date to be used.

The letter sizes to be used shall be as shown on the plans. The information shown on the signs shall be limited to that shown on the plans.

The signs shall be kept clean and in good repair by the Contractor.

Upon completion of the work, the signs shall be removed and disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13 of the Standard Specifications.

Full compensation for furnishing, erecting, maintaining, and removing and disposing of the construction project information signs shall be considered as included in the contract lump sum price paid for construction area signs and no additional compensation will be allowed therefor.

10-1.21 CONSTRUCTION AREA SIGNS

Construction area signs shall be furnished, installed, maintained, and removed when no longer required in conformance with the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

Attention is directed to the provisions in "Approved Traffic Products" of these special provisions. Type II retroreflective sheeting shall not be used on construction area sign panels.

Attention is directed to "Construction Project Information Signs" of these special provisions regarding the number and type of construction project information signs to be furnished, erected, maintained, and removed and disposed of.

The Contractor shall notify the appropriate regional notification center for operators of subsurface installations at least 2 working days, but not more than 14 calendar days, prior to commencing excavation for construction area sign posts. The regional notification centers include, but are not limited to, the following:

Notification Center	Telephone Number
Underground Service Alert-Northern California (USA)	1-800-642-2444 1-800-227-2600
Underground Service Alert-Southern California (USA)	1-800-422-4133 1-800-227-2600

Excavations required to install construction area signs shall be performed by hand methods without the use of power equipment, except that power equipment may be used if it is determined there are no utility facilities in the area of the proposed post holes.

Sign substrates for stationary mounted construction area signs may be fabricated from fiberglass reinforced plastic as specified under "Approved Traffic Products" of these special provisions.

10-1.22 TEMPORARY RAILING

Temporary railing (Type K) shall be placed as shown on the plans, as specified in the Standard Specifications or these special provisions or where ordered by the Engineer and shall conform to the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

Reflectors on temporary railing (Type K) shall conform to the provisions in "Approved Traffic Products" of these special provisions.

Temporary railing (Type K) shall conform to the details shown on Standard Plan T3. Temporary railing (Type K) fabricated prior to January 1, 1993, and conforming to 1988 Standard Plan B11-30 may be used, provided the fabrication date is printed on the required Certificate of Compliance.

Temporary railing (Type K), conforming to the details shown on Standard Plan T3 may be used. Temporary railing (Type K) fabricated prior to January 1, 1993, and conforming to 1988 Standard Plan B11-30 may be used, provided the fabrication date is printed on the required Certificate of Compliance and vertical holes are not drilled in the top of the temporary railing to secure temporary traffic screen to the temporary railing.

Attention is directed to "Public Safety" and "Order of Work" of these special provisions.

Temporary railing (Type K) placed in conformance with the provisions in "Public Safety" of these special provisions will be neither measured nor paid for.

10-1.23 TEMPORARY CRASH CUSHION MODULE

This work shall consist of furnishing, installing, and maintaining sand filled temporary crash cushion modules in groupings or arrays at each location shown on the plans, as specified in these special provisions or where designated by the Engineer. The grouping or array of sand filled modules shall form a complete sand filled temporary crash cushion in conformance with the details shown on the plans and these special provisions.

Attention is directed to "Public Safety", "Order of Work", and "Temporary Railing" of these special provisions.

GENERAL

Whenever the work or the Contractor's operations establishes a fixed obstacle, the exposed fixed obstacle shall be protected with a sand filled temporary crash cushion. The sand filled temporary crash cushion shall be in place prior to opening the lanes adjacent to the fixed obstacle to public traffic.

Sand filled temporary crash cushions shall be maintained in place at each location, including times when work is not actively in progress. Sand filled temporary crash cushions may be removed during a work period for access to the work provided that the exposed fixed obstacle is 4.6 m or more from a lane carrying public traffic and the temporary crash cushion is reset to protect the obstacle prior to the end of the work period in which the fixed obstacle was exposed. When no longer required, as determined by the Engineer, sand filled temporary crash cushions shall be removed from the site of the work.

MATERIALS

At the Contractor's option, the modules for use in sand filled temporary crash cushions shall be either Energite III Inertial Modules, Fitch Inertial Modules or Traffix Sand Barrels manufactured after March 31, 1997, or equal:

- A. Energite III Inertial Modules, manufactured by Energy Absorption Systems, Inc., One East Wacker Drive, Chicago, IL 60601-2076, Telephone 1-312-467-6750, FAX 1-800-770-6755.
 - 1. Distributor (Northern): Traffic Control Service, Inc., 8585 Thys Court, Sacramento, CA 95828, Telephone 1-800-884-8274, FAX 1-916-387-9734
 - 2. Distributor (Southern): Traffic Control Service, Inc., 1881 Betmor Lane, Anaheim, CA 92805, Telephone 1-800-222-8274, FAX 1-714-937-1070.
- B. Fitch Inertial Modules, manufactured by Roadway Safety Service, Inc., 1050 North Rand Road, Wauconda, IL 60084, Telephone 1-800-426-0839, FAX 1-847-487-9820.
 - 1.. Distributor (Northern): Traffic Control Service, Inc., 8585 Thys Court, Sacramento, CA 95828, Telephone 1-800-884-8274, FAX 1-916-387-9734
 - 2. Distributor (Southern): Traffic Control Service, Inc., 1881 Betmor Lane, Anaheim, CA 92805, Telephone 1-800-222-8274, FAX 1-714-937-1070.
- C. Traffix Sand Barrels, manufactured by Traffix Devices, Inc., 220 Calle Pintoresco, San Clemente, CA 92672, Telephone 1-949-361-5663, FAX 1-949-361-9205.

1. Russ Enterprises, Inc., 1533 Berger Drive, San Jose, CA 95112, Telephone 1-408-287-4303, FAX 1-408-287-1929.
2. Statewide Safety, P.O. Box 1440, Pismo Beach, CA 93448, Telephone 1-800-559-7080, FAX 1-805-929-5786.

Modules contained in each temporary crash cushion shall be of the same type at each location. The color of the modules shall be the standard yellow color, as furnished by the vendor, with black lids. The modules shall exhibit good workmanship free from structural flaws and objectionable surface defects. The modules need not be new. Good used undamaged modules conforming to color and quality of the types specified herein may be utilized. If used Fitch modules requiring a seal are furnished, the top edge of the seal shall be securely fastened to the wall of the module by a continuous strip of heavy duty tape.

Modules shall be filled with sand in conformance with the manufacturer's directions, and to the sand capacity in kilograms for each module shown on the plans. Sand for filling the modules shall be clean washed concrete sand of commercial quality. At the time of placing in the modules, the sand shall contain not more than 7 percent water as determined by California Test 226.

Modules damaged due to the Contractor's operations shall be repaired immediately by the Contractor at the Contractor's expense. Modules damaged beyond repair, as determined by the Engineer, due to the Contractor's operations shall be removed and replaced by the Contractor at the Contractor's expense.

INSTALLATION

Temporary crash cushion modules shall be placed on movable pallets or frames conforming to the dimensions shown on the plans. The pallets or frames shall provide a full bearing base beneath the modules. The modules and supporting pallets or frames shall not be moved by sliding or skidding along the pavement or bridge deck.

A Type R or P marker panel shall be attached to the front of the crash cushion as shown on the plans, when the closest point of the crash cushion array is within 3.6 m of the traveled way. The marker panel, when required, shall be firmly fastened to the crash cushion with commercial quality hardware or by other methods determined by the Engineer.

At the completion of the project, temporary crash cushion modules, sand filling, pallets or frames, and marker panels shall become the property of the Contractor and shall be removed from the site of the work. Temporary crash cushion modules shall not be installed in the permanent work.

MEASUREMENT AND PAYMENT

Temporary crash cushion modules will be measured by the unit as determined from the actual count of modules used in the work or ordered by the Engineer at each location. Temporary crash cushion modules placed in conformance with the provisions in "Public Safety" of these special provisions and modules placed in excess of the number specified or shown will not be measured nor paid for.

Repairing modules damaged by public traffic will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications. Modules damaged beyond repair by public traffic, when ordered by the Engineer, shall be removed and replaced immediately by the Contractor. Modules replaced due to damage by public traffic will be measured and paid for as temporary crash cushion module.

If the Engineer orders a lateral move of the sand filled temporary crash cushions and the repositioning is not shown on the plans, moving the sand filled temporary crash cushion will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications and these temporary crash cushion modules will not be counted for payment in the new position.

The contract unit price paid for temporary crash cushion module shall include full compensation for furnishing all labor, materials (including sand, pallets or frames and marker panels), tools, equipment, and incidentals, and for doing all the work involved in furnishing, installing, maintaining, moving, and resetting during a work period for access to the work, and removing from the site of the work when no longer required (including those damaged by public traffic) sand filled temporary crash cushion modules, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.24 EXISTING HIGHWAY FACILITIES

The work performed in connection with various existing highway facilities shall conform to the provisions in Section 15, "Existing Highway Facilities," of the Standard Specifications and these special provisions.

Plans of the existing Benicia Martinez Bridge and Overhead (Br. No. 28-153L) and the retrofit of the existing bridgeway be requested by fax from the Office of Structure Maintenance and Investigations, 1801 30th Street, Sacramento, California, Fax (916) 227-8357.

Plans of the existing bridges available to the Contractor are reproductions of the original contract plans with significant changes noted and working drawings and do not necessarily show normal construction tolerances and variances. Attention is directed to Section 7-1.06, "Safety and Health Provisions," of the Standard Specifications. Work practices and worker health

and safety shall conform to the California Division of Occupational Safety and Health Construction Safety Orders Title 8, of the California Code of Regulations including Section 5158, "Other Confined Space Operations."

REMOVE PAVEMENT MARKER

Existing pavement markers, including underlying adhesive, when no longer required for traffic lane delineation as determined by the Engineer, shall be removed and disposed of.

Full compensation for removing and disposing of pavement markers and underlying adhesive shall be considered as included in the contract price paid per tonne for asphalt concrete (Type A) and no separate payment will be made therefor.

REMOVE TRAFFIC STRIPE AND PAVEMENT MARKING

Traffic stripes and pavement markings to be removed shall be removed at the locations shown on the plans and at the locations designated by the Engineer.

Nothing in these special provisions shall relieve the Contractor from the Contractor's responsibilities as provided in Section 7-1.09, "Public Safety," of the Standard Specifications.

REMOVE ROADSIDE SIGN (WOOD POST)

Existing roadside sign, at those location shown on the plan to be removed, shall be removed and disposed of.

Sign panel shown on the plan shall be salvaged.

Existing roadside sign shall not be removed until replacement sign has been installed or until the existing sign is no longer required for the direction of public traffic, unless otherwise directed by the Engineer.

Full compensation for salvaging sign panels shall be considered as included in the contract unit price paid for remove roadside sign and no separate payment will be made therefor.

REMOVE ROADSIDE SIGN (METAL POST)

Existing roadside sign, at this location shown on the plan to be removed, shall be removed and disposed of.

Sign panel shown on the plan shall be salvaged.

Existing roadside sign shall not be removed until replacement sign has been installed or until the existing sign is no longer required for the direction of public traffic, unless otherwise directed by the Engineer.

Full compensation for salvaging sign panel shall be considered as included in the contract unit price paid for remove roadside sign and no separate payment will be made therefor.

REMOVE GATE

Existing gate, at the locations shown on the plans, shall be removed

Full compensation for removing and disposal of the gate shall be considered as included in the contract price paid per gate and no separate payment will be made therefor.

RELOCATE TRAILER

Existing trailer shall be relocated to the new location shown on the plan.

Full compensation for relocation of the trailer shall be considered as included in the contract price paid in lump sum. All the utility work associated with the relocation of the trailer will be paid for as an extra work as directed by Engineer.

RELOCATE EXISTING PARK FACILITIES

Existing Picnic Table, Park Trash Receptacle, Park Sign known as park facilities shall be removed and relocated to the new location as shown on the plans.

Each existing park facility shall be installed at the new location on the same day that they were removed from its original location.

Full compensation for relocation of the Park Facilities shall be considered as included in the contract price paid in lump sum.

RELOCATE SIGN PANEL

Existing sign panel shall be removed and relocated to the new location shown on the plans.

Each Sign panel shall be installed at the new location on the same day that the sign is removed from its original location.

Full compensation for relocation of the Sign Panel shall be considered as included in the contract price paid in lump sum.

MODIFY INLET

Existing pipe inlets and concrete drainage inlets shall be modified as shown on the plans.

Portland cement concrete shall be minor concrete or may be produced from commercial quality concrete containing not less than 350 kilograms of cement per cubic meter.

Modification of inlets shall be performed prior to paving and shall be limited to the area to be paved or surfaced during the working day in which the adjustment is performed. The top of the inlet grate or cover shall be protected from the asphalt concrete during paving operations by means of heavy plywood covers, steel plate covers or by other methods approved by the Engineer. Excess paving material shall be removed prior to rolling.

Where inlets are located in areas to be paved or surfaced, no individual structure shall be constructed to final grade until the paving or surfacing has been completed immediately adjacent to the structure.

Modify inlets will be measured by each one.

The contract price paid per inlet shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in modifying inlets, including removing portions of inlets, bar reinforcing steel, concrete and structure excavation and structure backfill, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

REMOVE CHAIN LINK FENCE(TYPE CL-1.8) WITH EXTENSION ARM AND 3-BARBED WIRES

Existing chain link fence, where shown on the plans to be removed, shall be removed and disposed of.

Access control shall be maintained at all times. Before leaving any work area, all fencing necessary to ensure the integrity of the original fenced areas shall be provided such that there are no gaps left between the existing fence and the fence being installed. Whether permanent or temporary fencing is used,

Full compensation for providing access control shall be considered as included in the contract price paid per linear meter for remove chain link fence (Type CL-1.8) with extension arm and 3-barbed wires and no additional compensation will be allowed therefor.

10-1.25 CLEARING AND GRUBBING

Clearing and grubbing shall conform to the provisions in Section 16, "Clearing and Grubbing," of the Standard Specifications and these special provisions.

Vegetation shall be cleared and grubbed only within the excavation and embankment slope lines.

At locations where there is no grading adjacent to a bridge or other structure, clearing and grubbing of vegetation shall be limited to 1.5 m outside the physical limits of the bridge or structure.

Existing vegetation outside the areas to be cleared and grubbed shall be protected from injury or damage resulting from the Contractor's operations.

Activities controlled by the Contractor, except cleanup or other required work, shall be confined within the graded areas of the roadway.

Nothing herein shall be construed as relieving the Contractor of the Contractor's responsibility for final cleanup of the highway as provided in Section 4-1.02, "Final Cleaning Up," of the Standard Specifications.

10-1.26 EARTHWORK

Earthwork shall conform to the provisions in Section 19, "Earthwork," of the Standard Specifications and these special provisions.

The Contractor's attention is directed to the following reports which are available from the State:

"Sediment Sampling and Analysis Report, New Benicica-Martinez Bridge Project, Contra Costa and Solano Counties, California," dated June 1999 and prepared by Caltrans District 4 Environmental Engineering Branch and Geocon Environmental.

"Site Investigation Report, Benicia-Martinez Bridge Upland Areas, Martinez, California," dated June 1999 and prepared by Caltrans District 4 Environmental Engineering Branch and Geocon Environmental.

Contaminated groundwater may be encountered during excavation for Pier 5 and for excavation of the cast-in-drilled-hole piling at Piers 2 through 4.

The Contractor's attention is directed to the need to minimize the structural excavation at Pier 5 and to minimize the area that will be disturbed by the removal of excavated material. The Pier 5 excavation shall be shored to the bottom of the excavation to minimize the disturbed area and to limit the amount of contaminated material to be disposed of. Equipment access ramps into the Pier 5 footing excavation will not be allowed if excavation is required beyond the shored area. The Contractor's shoring system shall be designed to be watertight so that no more than 75 liters/minute of water enters the excavation. Surface water runoff shall be diverted away from the Pier 5 excavation and surface water shall not be allowed to enter the excavation. If timber is used for portions of the shoring system, it shall be completely removed within the horizontal projection of the footing and within the excavation as the backfill is brought up.

The State has made arrangements for disposal of potentially contaminated ground water up to 75 liters/minute at certain times of the year from the excavations at Piers 2 through 5. During the time period of November 1 through June 30, disposal of groundwater from excavations shall be the responsibility of the Contractor. During the remaining portion of the year, groundwater collected from excavations may be piped and pumped by the Contractor to the Rhodia treatment plant for treatment at a rate of no more than 75 liters/minute and at a cost of **1.0** cents/liter and an additional \$750.00 per 12 hour shift. If the Contractor elects to use the Rhodia Treatment plant, the Contractor shall contract directly with Rhodia for treating water at Rhodia's facility. Disposal of groundwater in excess of 75liters/minutes during this period shall be the responsibility of the Contractor. The Contractor may make alternate arrangements for disposal of contaminated groundwater.

Before performing any pile installation or structure excavation for Pier 5, the Contractor shall submit to the Engineer, as provided in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications, a complete Pier 5 Construction Plan. The plan shall detail the methods that will be employed to install the piling, excavate for the footing, place the seal course, control and dispose of contaminated material and water including the sequence of construction of all aspects of the footing. The Engineer shall have 14 calendar days to review the plan. Should the Engineer fail to complete the review within this time allowance and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in reviewing the plan, the delay will be considered a right of way delay as specified in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

Sand shown on the plans to be placed at the bottom of structure excavations shall conform to the requirements of Section 19-3.025B, "Sand Bedding" of the Standard Specifications.

10-1.27 IMPORTED BORROW (LIGHTWEIGHT AGGREGATE)

Imported borrow (lightweight aggregate) shall consist of furnishing, placing and compacting lightweight aggregate material at the locations and to the lines and grades designated on the plans or specified in the special provisions. Imported borrow (lightweight aggregate) shall conform to the requirements specified for embankment and structure backfill in Section 19, "Earthwork," of the Standard Specifications and these special provisions.

Lightweight aggregate material shall consist of a rotary kiln expanded shale aggregate of the extruded type or a processed, naturally-occurring volcanic aggregate.

Lightweight aggregate material shall be, at the option of the Contractor, either coarse-graded or fine-graded as specified in these special provisions.

Lightweight aggregate material shall be coarse-graded material as specified in these special provisions.

Lightweight aggregate material shall be fine-graded material as specified in these special provisions.

Lightweight aggregate material shall be, fine-graded material as specified in these special provisions, and placed at the designated locations as shown on the plans.

Coarse-graded lightweight aggregate material, when deposited in place, shall conform to the following:

Gradation Requirements	
Sieve Size	Percent Passing
50-mm	100
37.5-mm	90 - 100
25.4-mm	50 - 100
19-mm	45 - 85
4.75-mm	25 - 50
600-µm	9 - 25
75-µm	0 - 15

Gradation will be determined in conformance with the requirements of California Test 202, except shaking in the sieves shall be limited to 5 minutes.

QUALITY REQUIREMENT

Resistance (R-Value)	50 minimum
Durability Index	35

Fine-graded lightweight aggregate material, when deposited in place, shall conform to the following:

GRADATION REQUIREMENT

Sieve Size	Percent Passing
25-mm	95 - 100
19-mm	90 - 100
9.5-mm	45 - 95
4.75-mm	25 - 60
600-µm	8 - 30
75-µm	0 - 15

Gradation will be determined in conformance with the requirements of California Test 202, except shaking in the sieves shall be limited to 5 minutes.

QUALITY REQUIREMENT

Resistance (R-Value)	50 minimum
Durability Index	35

When imported borrow (lightweight aggregate) is used as structure backfill for pipe culverts, the imported borrow (lightweight aggregate) shall have a minimum resistivity greater than or equal to 1500 ohm-cm and a pH greater than or equal to 5.5. The imported borrow (lightweight aggregate) shall have a chloride content less than or equal to 500 PPM and a sulfate content less than or equal to 2000 (parts per million) PPM. Minimum resistivity and pH shall be determined in conformance with the requirements of California Test Method 643, chloride content shall be determined in conformance with the requirements of California Test Method 422, and sulfate content shall be determined in conformance with the requirements of California Test Method 417.

Imported borrow (lightweight aggregate) shall have a maximum calculated saturated surface dry unit weight of 960 kg/m³. The saturated surface dry unit weight shall be calculated by adjusting the dry loose unit weight by the absorption of the coarse and fine fractions. The absorption shall be determined by California Test Methods 206 and 207, except that the samples shall be oven dry before soaking and shall be soaked for 24 hours plus or minus 30 minutes. To calculate the saturated surface dry unit weight: 1) multiply the percent coarse aggregate by the absorption of the coarse aggregate; 2) multiply the percent fines aggregate by the absorption of the fine aggregate; 3) add the two values from 1) and 2) and divide by 10000; 4) add one (1) to the result from 3) and multiply by the dry loose unit weight.

Imported borrow (lightweight aggregate) shall be placed and compacted to the designated dimensions as specified in Sections 19-1.03, "Grade Tolerance," and the requirements specified for embankment construction in Section 19-6, "Embankment Construction," of the Standard Specifications, except Section 19-5, "Compaction," of the Standard Specifications shall not apply.

Initial layers of imported borrow (lightweight aggregate) may be placed by end dumping from trucks, or by any other method approved by the Engineer.

Coarse-graded imported borrow (lightweight aggregate) shall be spread or placed in uniform layers of a maximum 0.3-m thickness before compaction. Compaction shall be obtained by a minimum of 3 complete coverage passes using smooth drum steel roller compaction equipment imposing contact pressure of 5,360 kg per-meter-width of the roller face, or by another method as approved by the Engineer. Sufficient moisture treatment shall be made to aid the compactive effort. Compaction using pneumatic-tired equipment or compaction within trenches or other limited access areas, or compaction in areas of low confining pressure shall be of a method approved by the Engineer.

Fine-graded imported borrow (lightweight aggregate) shall be spread or placed in such manner that will prevent bulking of the material and minimize particle breakdown. Fine-graded imported borrow (lightweight aggregate) shall be compacted in uniform layers of 0.2-m maximum thickness before compaction. Sufficient moisture treatment shall be made to aid the compactive effort. Compaction shall be obtained by a minimum of 3 complete coverage passes using smooth drum steel roller compaction equipment imposing contact pressure of 5,360 kg per-meter-width of the roller face. Track type equipment which imposes the equivalent contact pressure as that specified for steel drum rollers, as determined by the Engineer, may be used provided the 3 complete coverages of the tracks of the track type equipment are achieved. Compaction using pneumatic-tired equipment or compaction within trenches or other limited access areas, or compaction in areas of low confining pressure shall be of a method approved by the Engineer.

A test site using proposed lightweight aggregate material, shall be constructed and compacted when alternative compaction equipment and methods of compaction (including use of pneumatic-tired equipment in trenches, in limited access areas, and areas of low confining pressure) are proposed by the Contractor. The alternative compaction equipment and methods of compaction shall not be used until the alternative methods and equipment meet project and site conditions, as determined by the Engineer.

Quantities of imported borrow (lightweight aggregate) shall be paid for by the cubic meter calculated on the basis of the mass, measured in place in accordance with Section 9-1.01, "Measurement of Quantities," of the Standard Specifications divided by the 95 percent of the dry unit weight measured in accordance with California Test Method 212, using test procedure (b) Compaction Method.

The contract price paid per cubic meter for imported borrow (lightweight aggregate) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing imported borrow (lightweight aggregate), complete in place (including constructing and removing any test sites required), as shown on the plans, as specified in these special provisions, and as directed by the Engineer.

CONTAMINATED AND HAZARDOUS MATERIAL EXCAVATION

Contaminated and hazardous material excavation shall consist of excavating material identified on the plans as contaminated material, hazardous material, slag, or cinder within excavation limits shown on the plans, specified in the Standard Specifications, or specified or directed by the Engineer and placing or disposing of the material as specified in this section.

Excavated contaminated material, hazardous material, slag, and cinder shall be managed as follows:

- A. Contaminated material – Haul and place the material within the roadway prism from "L" 12+35 to "L" 14+20, dispose of the material at a site outside of the highway right of way where ambient environmental conditions will not cause contaminants to be released at concentrations that exceed applicable water quality objectives or could degrade waters of the State, or dispose of the material at a permitted waste management facility in conformance with Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications and these special provisions.
- B. Hazardous material – Haul and dispose of the material at a permitted hazardous waste management facility in conformance with Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications and these special provisions.
- C. Slag – Haul and dispose of the material at a permitted waste management facility in conformance with Section 7-1.13, "Disposal of Material outside the Highway Right of Way," of the Standard Specifications and these special provisions.
- D. Cinder – Haul and dispose of the material at a permitted waste management facility in conformance with Section 7-1.13, "Disposal of Material outside the Highway Right of Way," of the Standard Specifications and these special provisions.

Except that when the material is excavated from trenches for irrigation or electrical systems the material shall be used to backfill the trench.

Attention is directed to "Contaminated and Hazardous Material, General" of these special provisions for handling, characterization, and stockpiling requirements.

Contaminated and hazardous material excavation will be measured and paid for by the cubic meter. The quantities for payment will be determined as specified for the type of excavation involved.

Full compensation for excavating, loading, hauling, and placing or disposing of contaminated material shall be considered as included in the contract price paid per cubic meter for structure excavation (contaminated) and roadway excavation (contaminated) and no further compensation will be allowed therefor.

Full compensation for excavating, loading, hauling, and disposing of hazardous material shall be considered as included in the contract price paid per cubic meter for structure excavation (hazardous) and roadway excavation (hazardous) and no further compensation will be allowed therefor.

Full compensation for excavating, loading, hauling, and disposing of slag shall be considered as included in the contract price paid per cubic meter for structure excavation (slag) and no further compensation will be allowed therefor.

Full compensation for excavating, loading, hauling, and disposing of cinder shall be considered as included in the contract price paid per cubic meter for structure excavation (cinder) and roadway excavation (cinder) and no further compensation will be allowed therefor.

Pervious backfill material in connection with bridge work will be measured and paid for by the cubic meter as structure backfill (bridge).

Pervious backfill material within the limits of payment for retaining walls will be measured and paid for by cubic meter as structure backfill.

Sand below footings, as shown at Piers 16 and 17, shall be measured and paid by the cubic meter as sand backfill.

If structure excavation or structure backfill involved in bridges is not otherwise designated by type, and payment for the structure excavation or structure backfill has not otherwise been provided for in the Standard Specifications or these special provisions, the structure excavation or structure backfill will be paid for at the contract price per cubic meter for structure excavation (bridge) or structure backfill (bridge).

Structure excavation designated as (Type D), for footings at the locations shown on the plans, will be measured and paid for by the cubic meter as structure excavation (Type D). Ground water or surface water is expected to be encountered at these locations, but seal course concrete is not shown or specified. Structure excavation for footings at locations not designated on the plans as structure excavation (Type D) or (Type A), and where ground or surface water is encountered, except locations where seal course concrete is shown or specified, will be measured and paid for by the cubic meter as structure excavation (bridge).

Full compensation for submitting the Pier 5 Construction Plan shall be considered as included in the contract prices paid per cubic meter for the various items of excavation and backfill shown in the Engineer's Estimate and no additional compensation will be allowed therefor.

Full compensation for controlling and disposing of contaminated groundwater at excavations and cast-in-drilled-hole piling at Abutment 1 and Piers 2 through 5, including all costs of contracting for treatment of the water, shall be considered as included in the contract prices paid per cubic meter for the various items of excavation and backfill shown in the Engineer's Estimate and no additional compensation will be allowed therefor.

Full compensation for placing sand backfill under completed footings shall be considered as included in the contract price paid per cubic meter for sand backfill and no additional compensation will be allowed therefor.

Structure excavation (Bridge) at Abutment 1 will be measured and paid for as structure excavation (Bridge) (Hazardous).

10-1.28 DREDGING

All material, including bay sediment, gravel, and rock material resulting from Cast In Drilled Hole (CIDH) pile, structure excavation type A, over-excavation, and maintenance dredging operations, located either (1) within the steel shells and rock sockets at CIDH piling, (2) structure excavation for steel casing and precast concrete pile cap construction, except Pier 17 shall be considered dredging in these special provisions and under the terms of the various permits obtained by the Department. Attention is directed to "Upland Disposal" and "In-Bay (Aquatic) Disposal" of this section for disposal requirements of dredged material. Attention is directed to Sections "Permits and Licenses" and "Environmental Work Restrictions" of these special provisions.

Dredging for barge or equipment access will not be allowed at any locations.

Unless otherwise authorized in writing, all dredging shall be performed in the presence of the Engineer.

Sloping back of excavations beyond pay limits shown on the plans will be allowed. The maximum amount of actual dredging, as defined above, shall not exceed 16,000 cubic meters for the entire project. Over-excavation beyond the pay limits shown on the plans may be allowed if deemed necessary to complete the work, however no additional compensation shall be allowed therefore and these additional quantities are included in the maximum amount of dredging allowed. Lateral displacement of bay sediment material shall not be allowed. Maintenance dredging and removal of material entering excavations from outside the limits of excavation dredged by the Contractor shall be removed and no additional compensation shall be allowed therefor and these additional quantities are included in the maximum amount of dredging allowed. Modifications to the existing permits proposing revisions to the maximum quantities of dredged material shall not be allowed. If during the progress of the work, it becomes apparent that the Contractor may exceed the maximum quantity of dredged material permitted for this project, the Contractor shall immediately stop all dredging activities and notify the Engineer in writing. The Contractor shall then reevaluate the construction methods used to perform the dredging work and shall submit a revised dredging operation plan, as outlined elsewhere in these special provisions, to the Engineer, outlining the proposal to complete the work without exceeding the permitted quantity of dredged material. This revised dredging operation plan may require the use of alternate means and methods of construction, such as use of shoring, which may be required to complete the work. The Contractor shall not be allowed to resume any dredging activities, until the revised dredging operation plan has been approved in writing by the Engineer. There shall be no compensation or extension of contract time in accordance with Section 8-1.09, "Right of Way Delays," of the Standard Specifications, for any delays resulting from conforming to the requirements of this section of the special provisions.

Dredging shall be done in accordance with the provisions of the various permits obtained by the Department. All dredged material shall be disposed of according to the permit requirements and these special provisions.

DREDGING OPERATION PLAN

Prior to beginning any dredging work, the Contractor shall submit a Dredging Operation Plan for approval 60 calendar days prior to the proposed commencement of dredging. Dredging shall not commence until all comments have been answered and written approval has been granted by the Army Corps of Engineers. The plan shall include the following:

- A. Name and telephone number of the dredging Contractor's representatives on site;
- B. Army Corp of Engineers;
- C. Dredging start and completion dates;
- D. Schedule of dredging operations including sequence of work, anticipated quantities and production rates;
- E. Names of vessels;

- F. Dump scow numbers or identification;
- G. Bin or barge capacities;
- H. Identification of work as either maintenance dredging or new dredging;
- I. Discussion of proposed dredging procedures, including types of equipment to be used, method of slurry of the material with detailed drawings or specifications of the grid or centrifugal pump system;
- J. Quality of material to be removed;
- K. Overall location of the area authorized to be dredged;
- L. A vicinity map showing the proposed In-Bay (Aquatic) and Upland disposal sites;
- M. Proposed volume of material to be dredged and disposed;
- N. Dredging design depth based on Mean Lower Low Water (MLLW) and typical cross section including overdepth; and
- O. Date of last dredging operations and design depth.

The dredging operation plan shall also provide the following information:

- A. The controls being established to ensure that dredging operations occur at the locations shown on the plans and as specified in these special provisions.
- B. The controls being established to ensure that disposal of the dredged material at the disposal site is at the assigned location and depth and the horizontal and vertical positioning systems that will be utilized.
- C. Method of determining horizontal and vertical electronic positioning of dredge or dump scow during entire dredging operation at dredge site, disposal site and en route to and from disposal site.
- D. Contractor's Quality Control (CQC) procedures including:
 - 1. A description of the CQC organization including, a chart showing lines of authority; and acknowledgment that the Contractor quality control staff shall conduct the inspections for all aspects of the work specified and shall report to the Contractor's Project Manager, or someone of higher authority, in the Contractor's organization.
 - 2. The name, qualifications, duties, responsibilities and authorities of each person assigned a quality control function.
 - 3. A copy of the letter to the CQC manager; signed by an authorizing official of the firm, which describes the responsibilities and delegates the authorities of the CQC manager; shall be furnished to the CQC manager and shall be countersigned by the CQC manager acknowledging receipt.
 - 4. Reporting procedures and methods used to obtain information for quality control forms, including the submittal of displacement and capacity charts for all scows.

After acceptance of the Dredging Operation Plan, the Contractor shall notify the Engineer in writing of any proposed changes. Proposed changes are subject to acceptance by the Engineer.

SOLID DEBRIS MANAGEMENT PLAN

The Contractor shall submit a solid debris management plan 60 calendar days prior to commencement of work, a plan which describes measures to ensure that solid debris generated during any contract demolition or construction operation is retained and properly disposed of. At a minimum, the plan shall include the following:

- A. Source and expected type of debris;
- B. Debris retrieval method;
- C. Disposal method and site;
- D. Schedule of disposal operations; and
- E. Debris containment method to be used, if floatable debris is involved.

All such debris shall become the property of the Contractor and shall be disposed of outside the State's right of way in accordance with Section 7-1.13 of the Standard Specifications. No such material shall be disposed of within Army Corps of Engineers and Bay Conservation and Development Commission jurisdictions. Material deemed to be of historical significance as determined by the Engineer shall become the property of the State and will be disposed of by the State.

OVERFLOW

No overflow of dredged material or water will be allowed from the receiving barges, bins or dump scows during the dredging operations except as follows. Overflow will only be allowed if the Contractor includes provisions and operations acceptable to the Regional Water Quality Control Board, is included in the approved Storm Water Pollution Prevention Plan,

and the material is designated for disposal at the Carquinez Strait disposal site. Where overflow is allowed, overflow time shall be limited to 15 minutes per barge load per day and the discharge shall be below the water surface.

In the event the Contractor chooses to fill a receiving barge, bin or dump scow, the receiving vessel shall be located in an approved anchor site.

OVERFLOW AND LEAKAGE MONITORING REQUIREMENTS

Barges or dump scows having more than 10% loss in draft while transporting material to the disposal site shall be recorded on the daily report and shall not be used until repaired.

The Contractor shall provide equipment that will furnish a continuous printed record of readings and measurements of bulk density and mass flow rate for each pump. These records shall be provided to the Engineer as requested and approved in the Dredging Operation Plan. The Contractor shall provide a list of equipment that will provide the required records. In the event either velocity and/or displacement equipment breaks down during the dredging operation, the following actions shall be accomplished:

- A. An alternative means of measurement shall be performed as approved.
- B. Alternative measurements shall not exceed a duration of 72 hours after the equipment breakdown or as otherwise approved by the Engineer. Verification of repairs shall be provided to the Engineer in the form of receipts or other documentation acceptable to the Engineer.

For hydraulic dredges the Contractor shall provide equipment that will furnish a continuous printed record of readings for measurement of flow rate of the material within 20 feet of the dredge pump, and furnish a continuous printed record of readings for measurement of flow rate of the material within 20 feet of the discharge manifold. The Contractor shall also furnish continuous velocity records at booster pumps. Equipment shall be accessible from above water platforms. If the readings from the velocity flow equipment indicate leakage within the system, the Contractor shall immediately cease work and repair the leaks. In the event that the dredged material is pumped into a barge or scow, displacement shall be monitored as specified for clamshell dredges after dredging and before disposal at the disposal site. The Contractor shall furnish to the Engineer, displacement and capacity plans of all scows.

For clamshell dredges, the Contractor shall monitor hull displacement of each scow loaded by the dredge. Monitoring shall be continuous from initial loading through discharge at the disposal site. The Contractor may use the general configuration in these special provisions for developing his system of monitoring displacement or submit his own method for approval. The method shall provide average hull displacement of each scow as specified. The data recorders shall store two-minute averages of the one second input signals from the sensors. The Contractor shall provide and maintain throughout the duration of the contract, one data transfer unit with support software to the State within 30 Calendar days after award of the contract, which shall become State property upon completion of the contract. In the event the displacement monitoring equipment breaks down during the dredging operation for any of the scows, an alternative means of measurement shall be performed as approved by the Engineer and results reported using a form approved by the Engineer. Alternative measurements shall not exceed a duration of 72 hours after equipment breakdown. If repairs to the primary equipment is not accomplished within this period, the scow shall not be used until repaired.

The Contractor shall submit the continuous recording records specified for hydraulic dredge records and clamshell dredge reports on computer diskettes. Data shall be submitted on 3-1/2" (1.44 MB) disks, operating under MS-DOS 3.1 or newer version. All data shall be recorded in ASCII text. Any alternatives submitted by the Contractor shall be subject to the approval of the Engineer.

CONTROL AND MONITORING SURVEYS

A short to medium range Electronic Positioning System (EPS) or Global Positioning System (GPS) shall be provided on all vessels involved in dredging operations. The EPS shall be established, operated and maintained by the Contractor during the period of the contract when dredging work is actively underway. The EPS using range-range methods shall display and record the vessel's location continuously during dredging and transport for disposal. A continuous graphic printout plotter and/or graphic monitor shall be provided on any dredge utilizing a range-range positioning system and a complete record copy of the position data (dredge track history) including date, time, coordinates and Root Mean Square (quality of position closure); and such record shall be submitted to the Engineer as part of the daily report. The Engineer shall have access to the monitoring equipment in order to observe its operation during the dredging work.

The EPS system shall be similar or equal in design, performance, accuracy, operating characteristics, and frequency to those identified in the following technical reference; which is available for purchase at the listed source, or which may be reviewed at the Army Corps of Engineers Construction-Operations Division, San Francisco District Office, 333 Market Street, San Francisco, California:

"Hydrographic Surveying" Department of the Army Engineering Manual No. 1110-2-1003, 28 February 1991 (or latest version). Available at:

USACE Publications Depot
2803 52nd Avenue
Hyattsville, MD 20781-1102

The Contractor shall be responsible for establishing the horizontal control to locate active and/or passive shore-based EPS transmitter/receiver devices. All control shall meet Third Order, Class 1, accuracy standards as defined in the publication "Standards and Specifications for Geodetic Control Networks" published by the Federal Geodetic Control Committee (and referenced) under chapter 2 of the Army Corps of Engineers Manual "Hydrographic Surveying". The Contractor shall obtain all right-of-entry permits and/or leases as required to operate and maintain shore-based electronic equipment on public/private property.

EPS calibration techniques shall conform to standard hydrographic surveying practice; consistent with minimization of systematic errors inherent to, and consistent with, the selected EPS system as specified under Chapter 6 of the Army Corps of Engineers manual "Hydrographic Surveying". The Contractor shall be responsible for accurate and reliable EPS calibration for the duration of this contract.

TRANSPORTING AND DISPOSAL

The Contractor shall transport and dispose of the dredged material in accordance with these special provisions and the conditions of the various permits the State has obtained for this contract.

During transport to the disposal sites, no material shall be permitted to overflow, spill, or leak out of the barges, bins or dump scows.

Tugboats are required to use an electronic positioning system (i.e., a miniranger system with at least two transponders or a Global Positioning System (GPS) with a minimum accuracy and precision of 25 feet for disposal operations. If the positioning system fails, all disposal operations shall cease until the navigational capabilities are restored.

The Contractor shall maintain daily records of dredging operations, transportation schedules, barge load volumes disposed, and exact location and time of disposal.

The tug captain shall maintain a copy of all weather reports and shall make wind and sea observations.

The Contractor shall observe all dredging operations and submit reports containing; a description of operations for each barge load, a checklist, a transit route map, a printout of coordinates from each way point and release point, a record of radio transmission, and facsimile from the tug captain on a daily basis.

The Contractor shall allow observers from the State and other appropriate independent observers as specified in permits and approved by the Engineer to be present on disposal vessels on trips to the Carquinez Strait disposal site.

Development and implementation of a more sophisticated surveillance systems, which can be demonstrated to and approved by the Engineer to be effective and capable of being audited, may be substituted for one or more of the above provisions.

The Electronic Positioning System (EPS) and methods used for the dredge, as specified herein shall also be used to display and record the disposal vessel's location at one minute time intervals.

All of the above-mentioned documentation shall be submitted to the Engineer after each transportation and disposal events.

UPLAND DISPOSAL

Landfill disposal shall be provided by the Contractor for the following dredged material:

- A. Structure excavation Type A including existing rock and gravel backfill.
- B. Material resulting from the CIDH bedrock socket operations.
- C. Synthetic slurry used in the CIDH or CISS pile operations.
- D. Material in contact with synthetic slurry used in the CIDH or CISS pile operations.
- E. Waste concrete resulting from the CIDH and CISS pile operation.
- F. Material resulting from the test boring operations.
- G. Material resulting from the micropile operations.
- H. Serpentine material determined to be non-hazardous resulting from the CIDH, CISS, micropile, and test boring operation. Attention is directed to "Serpentine Material" of this section.
- I. Material that does not pass through a debris grid as further described in "In-Bay (Aquatic) Disposal" of this section.
- J. Material resulting from removal of slope protection including but not limited to asphalt concrete, concrete, and other waste material at the locations shown on the plans.

IN-BAY (AQUATIC) DISPOSAL

Aquatic disposal has been approved for the bay sediment material not listed in "Upland Disposal" of this Section consisting of clay, silt, or sand resulting from cleaning out of pilings and casings.

Aquatic disposal shall be at the Carquinez Strait Dredged Material Disposal Site (DMDS, SF-9).

The specific location within the disposal area will be determined by the Army Corps of Engineers at the time of review of the dredging operation plan.

All dredged material shall be slurried in one of the following manners:

- A. Pumped with a centrifugal pump prior to leaving the dredge site for the disposal site: or
- B. The material shall pass through a debris grid, with a maximum opening size of 12 inches by 12 inches, which will cover the entire loading area of the dump scow. All material that does not pass through the grid will be considered solid debris and shall be disposed of as specified in "Upland Disposal" of this Section. At a minimum all solid debris shall be removed from the grid and disposed of at the end of each 8-hour shift.

Each tug boat shall maintain a computer printout from GPS or other approved navigation system showing transit routes and disposal coordinates including the time and position of the disposal barge when the barge doors open and close.

If performance of the Contractor's work is delayed as a result of scheduling disposal of dredged material at the Carquinez Strait disposal site and if in the opinion of the Engineer this delay impacts the controlling operation, an extension of contract time determined pursuant to the provisions of Section 8-1.07, "Liquidated Damages," of the Standard Specifications will be granted. No additional compensation will be allowed therefor.

SERPENTINE MATERIAL

The material to be removed during installation of CIDH piling, CISS piling, test boring, and micropiling on this project may contain inclusions of serpentinite rock known to contain various forms of friable asbestos.

All serpentinite rock material, resulting from the Contractor's operations, that releases levels of friable asbestos in excess of those established by DTSC shall be treated as hazardous as defined by Title 8 and Title 22. The Contractor shall conduct his operations in conformance with all applicable Federal, State and local laws pertaining to the safety of workers and public while performing work that has a potential for creating friable asbestos, such as during excavation, handling, drilling, transportation, depositing or working of serpentinite material during the work involved in CIDH piling, CISS piling, test boring, and micropiling installations. The Contractor's attention is directed to Title 8 regarding the health and safety requirements established by Cal-OSHA for the workers and the public.

All material determined to be hazardous, due to friable asbestos, generated from the work involved in CIDH piling, CISS piling, test boring, and micropiling installations shall be removed and transported from the work location to a disposal site which has been certified by the EPA and the State regulatory agencies having jurisdiction over the disposal site and the contaminants of concern.

The Contractor shall take all necessary precautions to prevent the uncontrolled flow of water (except for groundwater) from entering the areas known to contain friable asbestos. In case such water does enter an area known to contain friable asbestos, such water shall be tested for asbestos fiber prior to discharge. No disposal of such water by pumping or other means shall be performed until results of such testing have been submitted to the Engineer for review and approval. If the results of such testing indicate that the level of asbestos fibers exceeds levels considered allowable by the applicable regulatory agencies, the water shall be handled in accordance with all applicable laws and regulations. Should testing of water be required as a result of the failure of the Contractor's measures to prevent uncontrolled water from entering the area known to contain friable asbestos, this testing shall be performed at the Contractor's costs and no additional compensation will be allowed therefor.

Should groundwater be encountered in the areas known to contain friable asbestos, the above testing shall be performed. The handling, treatment or disposal if necessary will be performed in accordance with all applicable laws and regulations. The work of testing, handling, treatment or disposal of the groundwater will be paid for as extra work in accordance with Section 9-1.03, "Force Account," of the Standard Specifications.

The work of testing, handling, treatment or disposal of material determined to be hazardous due to friable asbestos will be paid for as extra work in accordance with Section 9-1.03, "Force Account," of the Standard Specifications.

DISPOSAL SITE VERIFICATION LOG (DSVL)

The Contractor shall submit a weekly log by 10:00 a.m. each Monday to the Engineer. The DSVL sheets attached to the Army Corps of Engineers Permit (Pages 1 & 2) shall be used to enumerate the work accomplished during the preceding week for submission to the Army Corps of Engineers, Regulatory Branch. The Vessel Traffic Control System will issue a confirmation number, which shall be included in the weekly log. If the DSVL is not submitted on Monday by 10:00 a.m., no work shall begin on the dredging operations for that week.

HYDROGRAPHIC SURVEYS

The Contractor shall be responsible for providing an independent surveyor to perform the pre- and post-dredging and quality control surveys for performing the related computations and furnishing the required drawings.

The independent surveyor's equipment and work force shall be independent from the Contractor's. The name of the surveyor and samples of previous hydrographic work shall be submitted to the Engineer for review and approval.

The independent surveyor shall be required to document and certify in writing to the Engineer that he has at least three years of experience in hydrographic surveying of navigable channels and possess either a current land surveyor's or professional engineer's license valid in California and American Congress on Surveying and Mapping (ACSM) certification as an "Inshore Certified Hydrographic Surveyor." He shall provide documentation that modern electronic horizontal positioning and depth finding equipment are available for the surveys to be performed including DGPS (Differential Global Positioning System) capability and shall include as a minimum; the name, model, and year of manufacture of the electronic equipment; the electronic frequencies of the horizontal positioning equipment and the depth finding equipment; and the manufacturer's stated positioning accuracy and capability of the equipment proposed for usage. In addition, he shall document availability of a safe and suitable workboat for operation in the water where the surveys are to be performed, and that experienced staff are available for the operation of the workboat as well as the operation and calibration of the electronic positioning and depth finding equipment calibration. Survey procedures, data collection equipment, methods and densities, and equipment calibration for this work shall follow the criteria given in the hydrographic survey manual specified in Section "Dredging" for a Class I hydrographic survey. Survey line spacing shall not exceed the limits given in Table 3-1 of the hydrographic survey manual for a Class I hydrographic survey unless approved by the Engineer. Survey lines shall be referenced to the project horizontal and vertical datum. Cross sections shall be run at 25 feet center to center (c/c) and shall extend 25 feet past the slope-original ground intersect point.

Contractor hydrographic survey procedures (positioning modes, EPS calibration, accuracy requirements, depth measurement/calibration, and data reduction, adjustment, processing, and plotting) shall conform to industry standards identified in the hydrographic survey manual specified elsewhere in these special provisions. Horizontal location observations shall compensate for errors, geodetic corrections, and atmospheric variations. Data recordation, annotation, and processing procedures shall be in accordance with the hydrographic survey manual specified elsewhere. Failure to perform and process such surveys in accordance with the manual and these specifications will result in rejection and nonpayment for work performed. All vertical control shall be of second order accuracy, including levels for the setting of tide gage to Mean Lower Low Water (MLLW) elevation. An automatic electronic tide recording system shall be required during all surveying and dredging operations.

Survey data shall include tidal cycle(s) (whether ebb, flood or slack tide conditions) while performing surveys.

The Contractor shall conduct surveys using electronic system positioning method in accordance with the Hydrographic Survey Manual. The Contractor shall use an echo sounder to obtain soundings. The analog recording of soundings shall indicate a calibration check (bar check) of the echo sounding at the beginning and end of each analog paper change and at such times as necessary to ensure sounding accuracy. Echo sounder shall have a frequency of 200 kHz, with 3.5 degrees cone measured at 6 dB point. The top of the return signal trace shall be the point of interpretation of sounding. The bar check shall be taken at identical locations. Soundings shall be on MLLW datum. The excavation centerlines and slope toes shall be field marked on the fathogram chart during the data acquisition. The contract station, time of survey, tide height and direction that line is surveyed shall also be marked on the fathograms. Annotated survey data shall include tidal cycle(s), i.e., slack or slack tide conditions are occurring while performing surveys.

Field notes shall indicate the location of each sounding line, the date and the time (hour and minutes) each sounding line was taken and explanation for any line terminated early. The tide shall be recorded for each line surveyed and noted on the sections during the survey. Notes shall include tidal data, i.e., height of tide (Mean Lower Low Water Datum), bar checks, time of the tide readings and date and location of the tide gage used for each survey.

Bound field survey books shall be used to record all field data. Fully automated survey systems shall require a field log to supplement the data recorded on magnetic media.

The cross sections of hydrographic sounding line survey results shall be plotted at the scales specified in Table 3-1 of the hydrographic survey manual or as approved by the Engineer. Soundings shall be plotted on transparent sheets and show pay quantity excavation templates shown on the plans with survey cross-section. The Contractor's firm name shall be printed on each sheet along with contract name, number and date of survey. Plot scales shall be as approved by the Engineer.

The Contractor shall perform Pre-Dredging Surveys no earlier than 60 calendar days and no later than 30 calendar days before commencement of dredging. The Pre-Dredging Survey shall be completed with accuracy to one-tenth foot which delineates the following areas to be dredged, with overdepth allowances, existing depths, estimated quantities to be dredged for the project, and estimated quantities for overdepth.

The Contractor shall perform hydrographic Quality Control Surveys thirty days after start of dredging and every thirty calendar days thereafter, and after any natural event that would create shoaling of previously dredged areas of the project (e.g., severe storms and earthquakes). These surveys shall verify that all foundation excavation dimensions are being

obtained as specified. All surveys shall begin where dredging commenced and end as close as possible to last dredging position. The accuracy shall be consistent with the Pre-Dredging Survey above.

From the Quality Control Surveys, the Contractor shall compute quantities by the average end area method to the nearest cubic yard based on the sounding lines surveyed and the dredging section indicated on the contract drawings. Tabular summaries shall be submitted to show standard depth, overdepth, and total dredging quantities both incrementally and cumulative per pier location.

The Contractor shall perform a Post-Dredging Survey within 15 calendar days of the last disposal activity at each pier prior to placing backfill (last being defined as that activity after which no further activity occurs for 15 calendar days), a survey with accuracy to one-tenth foot which delineates the following: areas dredged: dredged depths, actual quantities dredged for the project, and actual quantities of overdepth. The Post-Dredging Survey shall contain the dates of commencement and completion. The Contractor shall substantiate the total quantity dredged by including calculations used to determine the volume difference (in cubic yards) between the Pre- and Post Dredging Surveys and explain any variation in quantities greater than 15% beyond estimated quantities.

The quantities calculated from pre-dredging, quality control, and post-dredging surveys shall only be used for permit reporting purposes. Quantities from these surveys shall not be used for measurement of quantities for payment.

The Contractor shall submit all drawings, field notes and quantity computations within five (5) calendar days after completion of any survey. The number of sets of drawings shall be as specified below. The Contractor shall mail or deliver drawings and computations to the Engineer for review and submission to the various agencies.

- A. Three (3) sets of transparent drawings for each survey.
- B. Three (3) sets of computer sheet printouts or calculation sheets for dredging quantities for each survey.
- C. Three (3) sets of cross sections for each survey.

The Contractor shall submit for each survey, the ASCII file of raw and corrected survey data. Data shall be on 3 1/2" (1.44 MB) disks, operating under MS-DOS 3.1 or newer version. The files shall have hydrosurvey information, in both raw and adjusted format. The raw data shall be original data from the hydrosurvey computer. The adjusted data shall be corrected to National Ocean Survey MLLW datum. The record of raw data shall be comma delimited and consist of the following information: index; "x" coordinate; "y" coordinate; "z" elevation; and time. Each adjusted record shall consist of the following information: index; "x" coordinate; "y" coordinate; "z" elevation; time; and tide. The index shall be the first entry, representing the sequence that each point was taken. The index shall be numerical, beginning with the number "one" and continuing until a 24 hour work effort is completed. Each day shall be in one file (one or more disks). This convention is applicable for both raw and adjusted data. Time shall be reported in Julian day and military hours and seconds. (For example, "17 March 1990, 9:00 A.M." would be "170390, 090000"). The recording distance between the hydrosurvey points shall be 10 feet or less. All data recorded shall be in ASCII text. Other Data collection formats will be considered if presented by the Contractor. Revisions in collection format will not be considered after the project has begun. All alternatives shall be approved by the Engineer.

The Contractor shall provide a complete listing of hydrographic equipment he will use on the project prior to the survey conference specified herein below.

At least five (5) calendar days prior to performing any survey, the person responsible for that survey, the Contractor's chief surveyor and/or the independent surveyor, shall meet with the Engineer in a survey conference to outline the scope of survey and section interval. No survey work shall be performed until such conference has taken place.

The Department will retain an amount equal to 5 percent of the estimated value of the associated item of work performed during each estimate period in which the Contractor fails to complete the hydrographic surveys.

Full compensation for all dredging, Dredging Operation Plan preparation and updating; preparing and implementing Solid Debris Management Plan; overflow and leakage monitoring; performing control and monitoring surveys; transporting and disposal of all dredged material to upland and aquatic disposal sites, preparation of disposal site verification logs; and performing hydrographic surveys including data collection and preparation of drawings, cross-sections and calculations shall be considered as included in the contract prices paid per cubic yard for structure excavation (D), and no additional compensation will be allowed therefor.

10-1.29 CEMENT-BENTONITE BACKFILL FOR PIER 5

Cement-bentonite backfill and dry bentonite backfill for pier 5 shall be placed in accordance with the provisions in Section 19, "Earthwork," of the Standard Specifications and these special provisions.

GENERAL

Prior to excavating any material for construction of Pier 5, the Contractor shall submit to the Engineer a complete Pier 5 Construction Plan as specified elsewhere in these special provisions.

Definitions.--The following definitions shall apply to the cement bentonite backfill at Pier 5:

1. Cement-Bentonite Backfill: A continuous low-strength, low-permeability water barrier formed by backfilling with the specified cement-bentonite mixture.
2. Groundwater Level: The piezometric level of the groundwater as determined from piezometers installed in the alluvium outside the excavation and shoring.
3. Well-Graded: Well-graded as used in this section defines a mixture of particle sizes that have no specific concentration or deficiency of one or more sizes. Well-graded is used to help define a material that, when placed in the excavation, produces a relatively impermeable material free from detrimental voids.
4. API: American Petroleum Institute.
5. API RP: API Recommended Practice.
6. Fines: Material passing the U.S. Standard No. 200 sieve, when tested in accordance with ASTM C117.

Submittals

The Contractor shall submit working drawings for the materials listed below to the Resident Engineer's Office at 757 Arnold Drive, Suite 200 Martinez, California 94553 at telephone number (925) 646-1996, for approval in accordance with the provisions in Section 5-1.02, "Plans and Working Drawings". For initial review, 10 sets shall be submitted. The mix design report shall be prepared under the supervision of and sealed by a professional engineer licensed in the State of California, with at least 5 years of experience in slurry backfill design and construction. After review, between 6 and 12 sets, as requested by the Engineer, shall be submitted to the Office for final approval and for use during construction.

1. Certifications, test results, and samples for all imported material, including bentonite. Provide manufacturer's written certification that geosynthetic clay liner provided for this project meet specified requirements.
2. Catalog and manufacturer's data sheets for cement-bentonite mixing and placing equipment.
3. Mix design report, including plan and sequence for mixing and placing cement-bentonite backfill.
4. Test results for design mix of cement-bentonite backfill including strength, permeability, slump, moisture content and grain size distribution.

Alternative Proposals

The Contractor may submit alternate proposals, in accordance with all permits obtained by the State, for the non-pervious backfill work at Pier 5 in accordance with the provisions in Section 5-1.14, "Cost Reduction Incentive" of the Standard Specifications. The Engineer shall be the sole judge as to the acceptability of alternate proposals and the Engineer's decision shall be final.

MATERIALS.--

Backfill--The cement-bentonite backfill mix shall be designed by Contractor. The mixed backfill shall meet the following requirements:

1. Hydraulic conductivity of field samples shall not exceed 1.0×10^{-6} cm/sec when tested in accordance with ASTM D5084. Hydraulic conductivity of lab-prepared mix design samples shall not exceed 5.0×10^{-7} cm/sec. Minimum compressive strength of 6.9MPa for backfill against bedrock and pile cap, and at Contractor's option, a minimum of 0.7MPa for backfill above the bedrock. All strengths are 28 days after placement. Cured samples shall not contain cracks or exhibit sidewall shrinkage.
2. Backfill shall be a mix of the following materials, as specified in this section, in the proportions determined by Contractor's mix design:
 - a. Imported fine-grained soil.
 - b. Bentonite.
 - c. Cement.
 - d. Water
3. The mix design report shall show the results of various tests at varying proportions of the above materials, and varying bentonite contents, so as to identify an appropriate mix to achieve the hydraulic conductivity specified. Initial and intermediate hydraulic conductivity testing may be conducted in fixed-wall parameters. Final testing to verify the mix hydraulic conductivity for the proposed mix design shall be accomplished in strict accordance with ASTM D5084.

4. The Engineer may order an increase in the amount of bentonite and cement to be added to the mixed backfill, at no addition cost, up to 3 percent by weight over the amount recommended in the mix design report if lab test results, field conditions, mixing equipment, or performance in the field does not meet the requirements of these special provisions.

Bentonite.--Bentonite for the slurry backfill shall be pulverized or powdered premium grade natural sodium cation bentonite, conforming to the requirements of the standards of API Specification 13A, with a minimum yield of 90 barrels per ton when tested in accordance with API RP 13B. Dry bentonite for use in construction joints and against concrete and excavation walls shall be powdered as required above or granular with a maximum particle size of 1 cm. Protect bentonite from moisture and contamination in transit and in storage at the site.

GCL (Geosynthetic Clay Liner): The GCL shall be new, first quality products designed and manufactured specifically for landfill cap type applications and shall have satisfactorily demonstrated by prior use to be suitable and durable for such purposes. The GCL shall consist of natural sodium bentonite clay, without chemical resistant enhancers or polymers, encapsulated between two geotextiles and meet all the criteria of this section. The geotextiles shall be manufactured to hold the bentonite clay in a stable, uniform thickness that does not shift or become dislodged during handling. The geotextiles may be woven or nonwoven provided that at least one side is needlepunched through the bentonite effectively attaching both geotextiles.

The GCL shall be Bentomat, as manufactured by Colloid Environmental Technologies Company (CETCO), Arlington Heights, Illinois (827-392-5800), Bentofix, as manufactured by Fluid Systems, Cincinnati, Ohio, (800-346-9107), or an approved equal.

The bentonite used in the GCL shall meet or exceed the manufacturer's most recent published specifications and the following requirements:

Property	Test Method	Value
Montmorillonite Content	X-Ray Diffraction	90%
Free Swell	USP-NF-XVII	24 cc minimum
Moisture Content	As specified by Manufacturer	As specified by Manufacturer
Water Absorption	ASTM E 946	800% minimum

The GCL shall meet or exceed the manufacturer's most recent published specifications and the following requirements:

Property	ASTM Method	Minimum Avg. Value Unless Stated Otherwise
Thickness, typical (mm)	D 1777	6.0 (dry)
Clay Mass/Area (gm/sq. meter)	D 3776 (mod.)	4.89 @ 12% moisture (or equivalent)
Grab Strength (Newtons)	D 4632	392
Wide Width Strength. (Newtons/mm)	D 4595	7.0
Puncture Resistance (Newtons)	D 4833	267
Permeability (cm/sec)	D 5084	1×10^{-9} cm/sec*
Angle of Friction (Degrees), Apparent Cohesion (kPa), MinARV Slip-Plane Interface Strength Within Hydrated Bentonite Layer	ASTM D3080, Modified **	12° 24 kPa
Finished GCL Roll Width (meters), MinARV	3.66	Linear Measurement

* At 206 kPa maximum effective confining stress.

** Test shall be run at 4.8, 23.8, and 47.6 kPa normal loads with samples submerged for 24 hours prior to testing. Shearing rate shall not exceed 1 mm per minute. Residual strengths shall be used to assess strength parameters. Provide stress-strain curves and plot of peak stress for each normal load.

Transport, unload, store, handle and deploy GCL in accordance with manufacturer requirements. Store rolls of GCL onsite in plastic-wrapped bundles to prevent moisture intrusion and hydration of bentonite. Remove any rolls or portions of rolls with visible moisture from the site. Maintain rolls in new condition until placed in the final cap location.

Cement.--Portland cement shall conform to the requirements of Section 90-2.01, "Portland Cement," of the Standard Specifications and these special provisions. Portland cement shall be Type II cement and shall meet the requirements of ASTM C150, including Table 1 and Table 2. The source of cement shall consistently supply material with similar chemical and physical properties. The source of cement shall not be changed from those submitted at the time of mix design without written approval by Engineer.

Admixtures.--The use of any admixture, or of any plugging or bridging agent, will not be permitted without prior written authorization from Engineer.

Select backfill.--This material is not available onsite and must be imported. Select backfill shall be free from roots, organic matter, trash, debris, rocks larger than 50 mm, and other deleterious materials. Select backfill shall conform to the following washed sieve gradation when tested in accordance with ASTM C117 and C136:

Sieve Size	Percent Passing by Weight
50-mm	100
25-mm	80 - 100
12.5-mm	65 - 98
4.75-mm	50 - 90
425-µm	15 - 50
75-µm	5 - 30

In lieu of the above gradation, a combination of coarse aggregate and fine aggregate conforming to Section 90-3, "Aggregate Gradings," of the Standard Specifications may be used provided the gradation parameters above can be achieved.

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Imported fine-grained material.--When tested in accordance with ASTM D4318, the Atterberg Limits of imported soil material shall conform to the following:

Liquid Limit: 25 to 55.
Plasticity Index: 10 to 30.

To the extent possible, obtain the imported fine-grained material at a low moisture content so that it behaves as a dry material. Protect imported fine-grained material from moisture and contamination both in transit and in storage at the site.

Water.--Water shall conform to the to Section 90-2.03, "Water," of the Standard Specifications.

IMPORTED MATERIAL ACCEPTANCE

Other than bentonite, all imported materials specified in this section are subject to the following requirements:

All tests necessary for Contractor to locate an acceptable source of imported material shall be made by Contractor. Certification that the material conforms to the Specification requirements along with copies of the test results from a qualified commercial testing laboratory shall be submitted to Engineer for approval at least 10 days before the material is required for use. All samples shall be furnished by Contractor at Contractor's sole expense. Samples shall be representative and be clearly marked to show the source of the material and the intended use on the project. Sampling of the source shall be done by Contractor in accordance with ASTM D75. Notify Engineer at least 24 hours prior to sampling. Engineer may, at Engineer's option, observe the sampling procedures. Tentative acceptance of the source shall be based on an inspection of the source by Engineer and/or the certified test results submitted by Contractor to Engineer, at Engineer's discretion. No imported materials shall be delivered to the site until the proposed source and materials tests have been tentatively accepted in writing by Engineer. Final acceptance will be based on tests made on samples of material taken from Contractor's on-site stockpile. All testing for final acceptance shall be performed by Engineer.

Tests by Contractor shall be made on samples taken at the place of production prior to shipment. Tests shall be as specified for the material in question. Samples of the finished product for testing shall be taken at least each 75 cubic meters of material or more often as determined by Engineer, if variation in gradation is occurring. Test results shall be presented in writing to Engineer within 48 hours after sampling.

If tests conducted by Contractor or Engineer indicate that the material does not meet Specification requirements, material placement shall terminate until corrective measures are taken. Material that does not conform to the Specification requirements and that has been placed in the Work shall be removed and replaced at Contractor's sole expense. Sampling and testing performed by Contractor shall be done at Contractor's sole expense.

BENTONITE ACCEPTANCE

Acceptance of bentonite by the Engineer is subject to the following requirements:

The Contractor shall submit to the Engineer certification from the manufacturer that the bentonite conforms with API Specification 13A and these special provisions prior to placing orders.

The Contractor shall submit samples of bentonite to the Engineer for tentative acceptance prior to placing orders. Samples shall be representative and clearly marked to show the source of the material and the intended use on the project. Final acceptance of bentonite shall be based on tests made on samples of bentonite taken from Contractor's bentonite storage facilities. All testing for final acceptance will be performed by Engineer.

EQUIPMENT

All equipment shall be maintained and operated in strict accordance with the manufacturer's instructions and recommendations. All equipment shall be free of fluid leaks which discharge substances onto the ground or into the excavation. Immediately repair or remove from the site all broken or leaky lines, hoses, valves, pistons, pipes, tanks, and other equipment components. Equipment shall be maintained in such condition that it will deliver the manufacturer's rated output. If inadequate quantity or quality of production is obtained, provide larger and/or different equipment.

Backfill Mixing and Placing Equipment: Equipment for mixing and placing backfill shall be a suitable type capable of producing a homogenous mixture of backfill materials meeting these special provisions. The Contractor may use a concrete batch plant, auger mixer, or ready-mix trucks to combine the ingredients. No mixing on the ground will be allowed.

Contractor shall submit a mixing plan to Engineer describing equipment and methods for placing the backfill. The Contractor shall obtain the Engineer's approval prior to starting excavation at Pier 5.

Moisture Control Equipment: Equipment for applying water shall be of a type and quality adequate for the Work, shall not leak, and shall be equipped with a distributor bar or other approved device to assure uniform application. Equipment for mixing and drying out material shall consist of blades, discs, or other approved equipment.

Quality Control Equipment: Provide all equipment necessary for Contractor's quality control testing. Minimum quality control testing by Contractor is specified hereinafter. Provide any additional equipment necessary for any additional testing Contractor elects to do. All equipment shall be maintained in good working order, and shall meet the requirements of the applicable test standards cited herein.

EXECUTION

Backfill Preparation.--Remove all concrete protrusions, disturbed material, formwork, trash, or other debris from excavation. Remove all loose or disturbed material from the sides and bottom of the excavation to the degree acceptable to the Engineer. Use water jet to clean all concrete surfaces prior to placing backfill. Maintain all surfaces in clean condition until backfill has been placed.

Groundwater Control.--Regardless of source of ground or surface water, provide for continuous removal of all ponded water in excavation. Attention is directed elsewhere in these special provisions for requirements for testing and disposing of contaminated groundwater from the excavation.

Backfilling.--Do not begin backfilling any portion of the excavation until such portion has been dewatered, cleaned, and accepted by Engineer. At the Contractor's option, the working slab and pile cap may be placed neat against the walls of the excavation in lieu of using the bentonite slurry. All cleaning and placement methods required for the slurry shall be included for the concrete backfill. Any areas where a questionable seal may occur between the concrete and the walls of the excavation shall be smoothed and excavated back to undisturbed bedrock prior to placement of concrete. Obtain approval of Engineer prior to placement of concrete.

Mixing of Backfill.--

1. Mixing shall generally be accomplished in the following stages:

- a. Thoroughly mix dry bentonite and cement with imported fine-grained select material.
- b. Thoroughly mix the backfill using a pugmill, batch plant, or other approved method.

2. The method of proportioning backfill components and mixing the backfill shall be determined by Contractor. The method used must meet the following criteria:

- a. The quantities and percentages of all backfill components shall be easily and accurately measurable by both Contractor and Engineer.
- b. The imported fine-grained material shall be broken down such that it is thoroughly dispersed in the backfill.
- c. The moisture content of the backfill shall be increased only with the addition of bentonite slurry. The use of water is prohibited unless it can be demonstrated the mixed proportions are equally wetted and homogenous.
- d. All backfill components shall be thoroughly dispersed and the backfill shall be homogeneous and shall have the properties specified herein.

3. Submit to Engineer at least 4 weeks prior to mixing and placing backfill, the backfill mixing plan. The plan shall contain, as a minimum, the general sequence of placement of backfill components, procedures to be used to verify that the proper proportions of each component are included, and the methods and equipment to be used to mix and place the backfill. Engineer must approve the plan prior to beginning placement.

4. The methods of mixing the backfill shall be demonstrated to Engineer at least 1 week prior to mixing any backfill and after approval of the Contractor's backfill mixing plan. The demonstration shall use the same methods, equipment, and personnel proposed for the excavation. The demonstration shall mix a minimum of 3 cubic meters of backfill. Backfill mixed for the demonstration may not be reused and placed in the excavation.

5. Engineer will make the determination on the acceptability of the backfill mixing procedures. If Engineer determines that the methods proposed are not sufficient to ensure the proper proportions, hydration, and dispersion of backfill components, Contractor shall change methods and repeat the demonstration at Contractor's sole expense.

6. The proportions of materials for each step shall be based on Contractor's mix design adjusted for field conditions.
7. Mix backfill at a moisture content to produce a mix having the consistency and appearance of wet concrete. The slump of the mixture, when measured in accordance with ASTM C143, shall generally be from 75 to 200 mm. Mix backfill into a homogeneous mass, free from large lumps or pockets of fines, sand, or gravel, or stones larger than 50 mm in their largest dimension.

Placing.--Backfill shall be placed in accordance with the following:

1. Sprinkle dry bentonite (approximately 5 mm thick) in granular or powdered form at backfill construction joints and horizontal surfaces. If dry bentonite will not remain stable, place bentonite concurrently with slurry backfill.
2. All vertical surfaces within the excavation (excavation walls and vertical faces of the footing and walls) shall receive a single layer of GCL just prior to backfilling. The GCL should be placed against as smooth a surface as possible. Overlap seams of at least 150 mm. Remove wrinkles, folds or other irregularities that would disrupt flow of water over the surface of the completed GCL. Provide GCL coverage as directed by the Engineer. Contractor is responsible for implementing and monitoring measures to prevent water from contacting the GCL until the backfill is placed in the excavation. If GCL is wetted by rainfall or other means prior to placing the backfill, the GCL shall be removed and replaced with new, unhydrated GCL material. Any visible damage to the GCL shall be repaired by placing a new sheet of GCL over the damaged area and extending the patch at least 305-mm beyond the damaged area.
3. Prevent raveling of soil, debris, or rock from walls of excavation.
4. Do not drop backfill, or deposit it in any manner that may cause segregation.
5. Surface of backfill is to be crowned to promote runoff of surface water.

Construction Joints.--Backfill shall be placed with the minimum number of construction joints. Joints may be horizontal, vertical, or have a positive slope. No overhangs shall be created. Remove all loose material, soil, or debris prior to placing dry powdered or granular bentonite at horizontal surfaces to receive new slurry backfill material. Thoroughly vibrate backfill against that previously placed using electric vibrators moved in the slurry, against the concrete footing and walls and against walls of the excavation. Repair any visible shrinkage cracks by filling with a water-bentonite slurry to satisfaction of Engineer.

Maintenance Of Backfill.--After backfill of any portion of the excavation is complete, maintain the backfill in an undamaged condition until covered with clean, uncontaminated select fill. Portions of the backfill intended to remain that dry, crack, desiccate, or are damaged in any other way shall be corrected by removing all desiccated or otherwise unacceptable backfill to a depth acceptable to Engineer and placing of new cement-bentonite backfill on the excavated surface to the final grade.

Cleanup.--After completion of backfilling operations, any remaining excavated material and backfill shall be removed from the ground surface in the construction area. The excess materials shall be disposed of at the location designated by Engineer. Engineer shall be the sole judge of satisfactory cleanup, and cleanup shall be performed until accepted by Engineer.

Quality Control Sampling And Testing.--The Contractor shall perform the sampling and control testing specified below, according to the methods specified below, and at the frequencies specified below. Samples shall be representative of the overall volume of material from which the sample is taken.

Material	Sampling And Testing	Frequency
Imported Fine-Grained Soil	Samples as delivered to site: 1. Percent passing the 75- μ m sieve 2. Atterberg limits 3. Moisture content	Every 75 cu meters
Backfill – Immediately Prior to Placing in Excavation	Random sample: 1. Percent passing the 75- μ m sieve 2. Grain size distribution 3. Moisture content 4. Slump 5. Unit weight 6. Permeability 7. Compressive strength	Every 75 cu meters

Tests shall conform to the following standards:

Test	Standard
Percent passing 75- μ m sieve	ASTM D1140
Grain size distribution	ASTM C136
Moisture content	ASTM D2216
Atterberg limits	ASTM D4318
Slump	ASTM C143
Unit weight of backfill	ASTM C138
Permeability	ASTM D2434
Compressive strength	ASTM C39

The Contractor shall sufficiently sample and test, using an Independent Testing Laboratory and independently of the Engineer's testing, to maintain materials and workmanship in accordance with the Contract Documents. Tests shall be performed in a timely manner and the results immediately submitted in writing to Engineer within 12 hours of test completion. Test results shall become the property of OWNER. Contractor shall be responsible for representative, quality, and accurate sampling and testing. Mathematical calculations shall be checked by someone other than the person performing the original calculations.

Whenever tests conducted by Contractor or Engineer indicate material or workmanship not in accordance with the Contract Documents, work shall be halted and the cause of the discrepancy shall be identified. Work not in accordance with the Contract Documents shall be removed, replaced, repaired, or otherwise corrected so as to conform to these Contract Documents, as ordered by the Engineer.

Sampling and testing performed by Contractor, work necessary to identify the cause of any nonconformance, and remedial work necessary because of construction not in accordance with the Contract Documents shall be at Contractor's sole expense.

PAYMENT.--

Structure backfill (bridge) (low permeable) of the various strengths shown on the plans for use at Pier 5 will be measured and paid for by the cubic meter in the same manner as specified for structure backfill (bridge).

The contract unit price paid per cubic meter for structure backfill (bridge) (low permeable) of the various strengths shown on the plans shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and placing the low permeable backfill, GCL and dry bentonite, including submittal of all required information, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for additional cement or bentonite ordered by the Engineer in low permeable backfill for Pier 5 shall be considered as included in the contract price paid per cubic meter for structure backfill (bridge)(low permeable) of the various strengths shown on the plans and no additional compensation will be allowed therefor.

10-1.30 EROSION CONTROL (BLANKET)

Erosion control (blanket) shall conform to the details shown on the plans, the provisions in Section 20-3, "Erosion Control," of the Standard Specifications and these special provisions.

Erosion control (blanket) work shall consist of applying seed and commercial fertilizer and installing erosion control blanket to unlined ditches and swales as shown on the plans and other areas designated by the Engineer.

MATERIALS

Materials shall conform to the provisions in Section 20-2, "Materials," of the Standard Specifications and these special provisions.

Seed

Seed for erosion control (blanket) shall conform to the provisions specified for seed under "Erosion Control (Type D)" of these special provisions.

Erosion Control Blanket

Erosion control blanket shall consist of straw or wood excelsior mats secured in place with wire staples and shall conform to the following:

- A. Excelsior blanket material shall consist of machine produced mats of curled wood excelsior with 80 percent of the fiber 150 mm or longer. The erosion control blanket shall be of consistent thickness and the wood fiber shall be evenly distributed over the entire area of the blanket. The top surface of the blanket shall be covered with a photo-degradable extruded plastic mesh. The blanket shall be smolder resistant without the use of chemical additives and shall be non-toxic and non-injurious to plant and animal life. Erosion control blanket shall be furnished in rolled strips, 1220 mm \pm 25 mm in width, and shall have an average mass of 0.5-kg/m² \pm 10 percent at the time of manufacture.
- B. Straw blanket shall be machine produced mats of straw with a lightweight photo-degradable netting on top. The straw shall be adhered to the netting with biodegradable thread or glue strip. The straw erosion control blanket shall be of consistent thickness and the straw shall be evenly distributed over the entire area of the blanket. Straw erosion control blanket shall be furnished in rolled strips with a minimum width of 2 m, minimum length of 25 m \pm one m and a minimum mass of 0.27-kg/m².
- C. Staples for erosion control blankets shall be made of 11-gage minimum steel wire and shall be U-shaped with 200-mm legs and 50-mm crown.

APPLICATION

Erosion control (blanket) materials shall be placed in separate applications as follows:

- A. The first application shall consist of applying seed and commercial fertilizer at the following rates and in the following sequence:

Seed and commercial fertilizer shall be applied at the rates indicated in the following table. If hydro-seeding equipment is used to apply seed, fiber, compost, and commercial fertilizer, the mixture shall be applied within 30 minutes after the seed has been added to the mixture.

Material	Kilograms Per Hectare (Slope Measurement)
Fiber	310.0
Compost	940.0
Non-Legume Seed	72.0
Legume Seed	14.0

- B. The second application shall consist of installing the erosion control blanket over the seed and commercial fertilizer application.
- C. Erosion control blanket strips shall be placed loosely along the unlined ditch or swale with the longitudinal joints parallel to the centerline of the unlined ditch or swale. Longitudinal and transverse joints of blankets shall be overlapped according to the manufacturer's recommendations and stapled. Staples shall be driven perpendicular to the slopes, and shall be located and spaced in conformance with the manufacturer's instructions. Ends of the blankets shall be secured in place in conformance with the manufacturer's instructions.

MEASUREMENT AND PAYMENT

The quantity of erosion control (blanket) will be determined by the square meter from actual slope measurement of the area covered by the erosion control blanket.

The contract price paid per square meter for erosion control (blanket) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing erosion control blanket, complete in place, including furnishing and applying pure live seed, compost, fiber, and the materials for the erosion control blanket, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.31 EROSION CONTROL (TYPE D)

Erosion control (Type D) shall conform to the provisions in Section 20-3, "Erosion Control," of the Standard Specifications and these special provisions.

Erosion control (Type D) work shall consist of applying erosion control materials to embankment and excavation slopes and other areas disturbed by construction activities. Erosion control (Type D) shall be applied during the period starting September 1 and ending December 31 ; or, if the slope on which the erosion control is to be placed is finished during the winter season as specified in "Water Pollution Control" of these special provisions, the erosion control shall be applied immediately; or, if the slope on which the erosion control is to be placed is finished outside both specified periods and the contract work will be completed before September 1 , the erosion control shall be applied as a last item of work.

Prior to installing erosion control materials, soil surface preparation shall conform to the provisions in Section 19-2.05, "Slopes," of the Standard Specifications, except that rills and gullies exceeding 50 mm in depth or width shall be leveled. Vegetative growth, temporary erosion control materials and other debris shall be removed from areas to receive erosion control.

MATERIALS

Materials shall conform to the provisions in Section 20-2, "Materials," of the Standard Specifications and these special provisions.

Seed

Seed shall conform to the provisions in Section 20-2.10, "Seed," of the Standard Specifications. Individual seed species shall be measured and mixed in the presence of the Engineer.

Seed shall be delivered to the project site in unopened separate containers with the seed tag attached. Containers without a seed tag attached will not be accepted.

A sample of approximately 30 g of seed will be taken from each seed container by the Engineer.

Legume Seed

Legume seed shall be pellet-inoculated or industrial-inoculated and shall conform to the following:

- A. Inoculated seed shall be inoculated in conformance with the provisions in Section 20-2.10, "Seed," of the Standard Specifications.
- B. Inoculated seed shall have a calcium carbonate coating.
- C. Industrial-inoculated seed shall be inoculated with Rhizobia and coated using an industrial process by a manufacturer whose principal business is seed coating and seed inoculation.
- D. Industrial-inoculated seed shall be sown within 180 calendar days after inoculation.
- E. Legume seed shall consist of the following:

LEGUME SEED

Botanical Name (Common Name)	Percent Germination (Minimum)	Kilograms Pure Live Seed Per Hectare (Slope Measurement)
Lupinus succulentus (Arroyo Lupine)	50	4.0
Lotus purshianus (Purshings Lotus)	50	4.0
Trifolium incarnatum (Crimson Clover)	50	6.0

Non-Legume Seed

Non-legume seed shall consist of the following:

NON-LEGUME SEED

Botanical Name (Common Name)	Percent Germination (Minimum)	Kilograms pure live seed per hectare (Slope measurement)
<i>Eschscholzia californica</i> (California Poppy)	60	1.0
<i>Achillea millefolia</i> (White Yarrow)	50	1.0
<i>Clarkia amoena</i> (Farewell to Spring)	50	1.0
<i>Hordeum vulgare</i> 'UC 603' (Cereal Barley)	60	30.0
<i>Festuca rubra</i> 'Molate' (Molate Red Fescue)	60	10.0
<i>Nassella pulchra</i> * (Purple Needle Grass)	60	6.0
<i>Bromus carinatus</i> * (California Brome)	60	8.0
<i>Elymus glaucus</i> 'Berkeley'* (Blue Wildrye)	60	10.0
<i>Vulpia microstachys</i> (Six Weeks Fescue)	60	5.0

*California native species .

Straw

Straw shall conform to the provisions in Section 20-2.06, "Straw," of the Standard Specifications and these special provisions.

Wheat and barley straw shall be derived from irrigated crops.

Prior to delivery of wheat or barley straw to the project site, the Contractor shall provide the date of harvest and the name, address and telephone number of the grower.

Compost

Compost shall be derived from green material consisting of chipped, shredded or ground vegetation or clean processed recycled wood products or a Class A, exceptional quality biosolids composts, as required by the United States Environmental Protection Agency (EPA), 40 CFR, Part 503c regulations or a combination of green material and biosolids compost. The compost shall be processed or completed to reduce weed seeds, pathogens and deleterious material, and shall not contain paint, petroleum products, herbicides, fungicides or other chemical residues that would be harmful to plant or animal life. Other deleterious material, plastic, glass, metal or rocks shall not exceed 0.1 percent by weight or volume. A minimum internal temperature of 57°C shall be maintained for at least 15 continuous days during the composting process. The compost shall be thoroughly turned a minimum of 5 times during the composting process and shall go through a minimum 90-day curing period after the 15-day thermophilic compost process has been completed. Compost shall be screened through a maximum 6 mm screen. The moisture content of the compost shall not exceed 35 percent. Moisture content shall be determined by California Test 226. Compost products with a higher moisture content may be used provided the weight of the compost is increased to equal the compost with a moisture content of 35 percent. Compost will be tested for maturity and stability with a solvita test kit. The compost shall measure a minimum of 6 on the maturity and stability scale.

Stabilizing Emulsion

Stabilizing emulsion shall conform to the provisions in Section 20-2.11, "Stabilizing Emulsion," of the Standard Specifications and these special provisions. Stabilizing emulsion shall be nonflammable and shall have an effective life of at least one year.

Stabilizing emulsion shall be in a dry powder form, may be reemulsifiable, and shall be a processed organic adhesive derivative of *Plantago insularis* used as a soil tackifier.

APPLICATION

Erosion control materials shall be applied in 3 separate applications in the following sequence:

- A. The following mixture in the proportions indicated shall be applied with hydro-seeding equipment within 60minutes after the seed has been added to the mixture:

Material	Kilograms Per Hectare (Slope Measurement)
Fiber	300.0
Compost	1000.0
Non-Legume Seed	72.0
Legume Seed	14.0

- B. Straw shall be applied at the rate of 4 tonnes per hectare based on slope measurements. Incorporation of straw will not be required.
- C. The following mixture in the proportions indicated shall be applied with hydro-seeding equipment:

Material	Kilograms Per Hectare (Slope Measurement)
Fiber	300.0
Compost	1000.0
Stabilizing Emulsion (Solids)	140.0

- D. The ratio of total water to total stabilizing emulsion in the mixture shall be as recommended by the manufacturer.

Once straw work is started in an area, stabilizing emulsion applications shall be completed in that area on the same working day.

The proportions of erosion control materials may be changed by the Engineer to meet field conditions.

MEASUREMENT AND PAYMENT

The contract price paid per kilogram for compost (erosion control) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in applying compost for erosion control, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.32 FIBER ROLLS

Fiber rolls shall conform to the details shown on the plans and these special provisions.

MATERIALS

Fiber rolls shall consist of one of the following:

- A. Fiber rolls shall be constructed with manufactured blankets consisting of one material or a combination of materials consisting of wood excelsior, rice or wheat straw, or coconut fibers. Blankets shall measure approximately 2.0 to 2.4 m wide by 20 m to 29 m in length. Wood excelsior material shall have individual fibers, 80 percent of which shall be 150 mm or longer in fiber length. Blankets shall have a photodegradable plastic netting or biodegradeable jute, sisal or coir fiber netting on at least one side. The blanket shall be rolled on the blanket's width and secured with jute twine spaced 2 m apart along the roll for the full length and 150 mm from each end of the individual rolls. The finished roll diameter shall be a minimum of 200 mm and a maximum of 250 mm and shall weigh not less than 0.81 kg/m. Overlapping of more than one blanket may be required to achieve the finished roll diameter. When overlapping is required, blankets shall be longitudinally overlapped 150 mm along the length of the fabric.
- B. Fiber rolls shall be pre-manufactured rice or wheat straw, wood excelsior or coconut fiber rolls encapsulated within a photodegradable plastic or biodegradeable jute, sisal or coir fiber netting. Each roll shall be a minimum of 200 mm and a maximum of 250 mm in diameter, 3 m to 6 m in length and shall weigh not less than 1.6 kg/m. The netting shall have a minimum durability of one year after installation. The netting shall be secured tightly at each end of the individual rolls.
- C. Stakes shall be fir or pine and shall be a minimum of 19 mm x 38 mm x 450 mm in length. Metal stakes may be used as an alternative. The Contractor shall submit a sample of the metal stake to the Engineer prior to installation. The tops of the metal stakes shall be bent over at a 90-degree angle. No additional compensation will be allowed for the use of a metal stake.

INSTALLATION

Fiber rolls shall be installed approximately parallel to the slope contour. Fiber rolls shall be installed prior to the application of other erosion control materials.

Furrows shall be constructed to a depth of 50 mm to 100 mm, and at a sufficient width to hold the fiber rolls. The installed angle of the fiber roll to the slope contour shall create a 2 to 5 percent grade from the center to the edge of the slope. The bedding area for the fiber roll shall be cleared of obstructions including, but not limited to, rocks, clods and debris greater than 25 mm in diameter prior to installation. Fiber rolls shall be installed, overlapped and secured as shown on the plans.

Stakes shall be installed 600 mm apart along the total length of the rolls and 300 mm from the end of each individual roll. Stakes shall be driven flush or a maximum of 50 mm above the roll.

If soil or slope conditions present difficulty in constructing furrows, the Contractor may install fiber rolls using rope and notched stakes to restrain the fiber roll against the slope face in conformance with these special provisions. The additional cost of installing fiber rolls using rope and notched stakes shall be at the Contractor's expense.

Rope shall be sisal or manila, biodegradable, with a diameter of no less than 6.35 mm. Stakes shall be fir or pine and shall be a minimum of 19 mm x 38 mm x 450 mm in length and shall have a 12 mm x 12 mm notch cut 100 mm from the top.

Stakes shall be placed on alternate sides of the fiber roll, spaced 600 mm apart as shown on the plans. The stakes shall be driven into the slope until the notch is even with the top of the fiber roll. Rope shall be knotted at each stake and laced between the stakes as shown on the plans. After installation of the rope, the stakes shall be driven into the slope such that the rope holds the fiber roll snug to the slope face. Furrows shall not be required. If metal stakes are used instead of wood stakes, the tops shall be bent over so that the rope can be laced and knotted as with the wood stakes.

MEASUREMENT AND PAYMENT

Fiber rolls will be measured by the meter from end to end along the centerline of the installed rolls deducting the widths of overlaps.

The contract price paid per meter for fiber rolls shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing fiber rolls, complete in place, including stakes, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.33 ENVIRONMENTALLY SENSITIVE AREA (GENERAL)

The Contractor's attention is directed to the designated Environmentally Sensitive Area (ESA), shown on the plans. The exact location of the boundaries of environmentally sensitive area shall be established by the Engineer and clearly delineated by the placement of temporary fence (Type ESA) as described in these special provisions.

Within the boundaries of an ESA, no project related activities shall take place. This specifically prohibits vehicle access, storage or transport of any materials, including hydrocarbon and lead contaminated material, or any other project related activities.

10-1.34 FIBER ROLL CHECK DAM

Fiber roll check dam shall be installed and maintained as shown on the plans, as specified in these special provisions, and as directed by the Engineer.

Attention is directed to "Water Pollution Control" of these special provisions.

MATERIALS

Materials shall conform to the provisions in Section 20-2, "Materials," of the Standard Specifications and these special provisions.

Fiber Rolls

- A. Fiber rolls shall be constructed with manufactured blankets consisting of one material or a combination of materials consisting of wood excelsior, rice or wheat straw, or coconut fibers. Blankets shall measure approximately 2.0 to 2.4m wide by 20 m to 29 m in length. Wood excelsior material shall have individual fibers, 80 percent of which shall be 150 mm or longer in fiber length. Blankets shall have a photodegradable plastic netting or biodegradeable jute, sisal or coir fiber netting on at least one side. The blanket shall be rolled on the blanket's width and secured with jute twine spaced 2 m apart along the roll for the full length and 150 mm from each end of the individual rolls. The finished roll diameter shall be a minimum of 200 mm and a maximum of 250 mm and shall weigh not less than 0.81 kg/m. Overlapping of more than one blanket may be required to achieve the finished roll diameter. When overlapping is required, blankets shall be longitudinally overlapped all 150 mm along the length of the fabric.

- B. Fiber rolls shall be pre-manufactured rice or wheat straw, wood excelsior or coconut fiber rolls encapsulated within a photodegradable plastic or biodegradeable jute, sisal or coir fiber netting. Each roll shall be a minimum of 200 mm and a maximum of 250 mm in diameter, 3 m to 6 m in length and shall weigh not less than 1.6 kg/m. The netting shall have a minimum durability of one year after installation. The netting shall be secured tightly at each end of the individual rolls.
- C. Stakes shall be fir or pine and shall be a minimum of 19 mm x 38 mm x 600 mm in length.

INSTALLATION

Fiber rolls shall be installed approximately parallel to the slope contour across the centerline of ditch or drainage line and secured as shown on the plans. Fiber rolls shall be installed prior to the application of other erosion control materials.

Furrows shall be constructed to a depth of 50 mm to 100 mm, and at a sufficient width to hold the fiber rolls. The furrow shall be cleared of obstructions including, but not limited to, rocks, clods, mulch and debris greater than 25 mm in diameter prior to installation. Fiber rolls shall be installed in the furrow, and secured as shown on plans. Excess soil from excavation of the furrow shall be disposed of uphill of the installed fiber rolls.

Stakes shall be installed 600 mm apart along the total length of the rolls and 300 mm from the end of each individual roll. Stakes shall be driven flush or a maximum of 50 mm above the roll.

At the option of the Contractor, fiber rolls may be installed using rope and notched stakes to restrain the fiber roll against the slope face in conformance with these special provisions. The furrow will not be required. The additional cost of installing fiber rolls using rope and notched stakes shall be at the Contractor's expense.

Rope shall be sisal or manila, biodegradable, with a diameter of no less than 6.35 mm. Stakes shall be fir or pine and shall be a minimum of 19 mm x 38 mm x 600 mm in length and shall have a 12 mm x 12 mm notch cut 100 mm from the top.

Stakes shall be placed on alternate sides of the fiber roll, spaced 600 mm apart as shown on the plans. The stakes shall be driven into the slope until the notch is even with the top of the fiber roll. Rope shall be knotted at each stake and laced between the stakes as shown on the plans. After installation of the rope, the stakes shall be driven into the slope such that the rope holds the fiber roll snug to the slope face.

Wood stakes shall be placed on either side of the fiber roll with the notch facing away from the roll, as shown on the plans.

MEASUREMENT AND PAYMENT

Fiber roll check dam will be measured by the unit with each unit consisting of 3 fiber rolls installed as shown on the plans.

The contract unit price paid for fiber roll check dam shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing fiber rolls, complete in place, including stakes, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.35 TEMPORARY COVER

Temporary cover shall conform to the details shown on the plans. The minimum quantity of temporary cover required for this project shall be 6,000 square meters.

The Contractor shall use temporary cover as one of the various measures to prevent water pollution. The Storm Water Pollution Prevention Plan shall graphically show the use of temporary cover in relation to other water pollution control work specified elsewhere in these special provisions.

MATERIALS

Materials shall conform to the following for either plastic or fabric sheeting:

If fabric is used, the fabric shall be a minimum 115 g/m² slit film woven fabric made of monofilaments of polypropylene. The fabric shall be non biodegradable, resistant to sunlight deterioration, inert to most soil chemicals and furnished with sealed edges on all sides to prevent unraveling. The fabric shall also conform to the following:

Properties	
Grab tensile strength	0.85-0.95 kn
Elongation at break (minimum)	15%

If plastic sheeting is used, the sheeting shall be polyethylene, new and a minimum of 0.33 mm thickness.

INSTALLATION

Fabric or plastic sheeting shall be placed and anchored as shown on the plans. Abutting edges shall overlap a minimum of a 0.6 m. A weight such as rock bags shall be placed on the overlap area at a maximum spacing of 2.4 m. Anchoring temporary cover by using staples or wooden lath and anchors may be allowed in lieu of rock bags as determined by the Engineer. The Contractor shall submit details for any alternative anchoring system to the Engineer for approval prior to installation. Non-abutting edges shall be embedded a minimum of 150 mm in native soil.

Temporary cover damaged as a result of the Contractors operations shall be replaced by the Contractor at his expense.

MEASUREMENT AND PAYMENT

The contract lump sum price paid for temporary cover shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing, maintaining and removing temporary cover, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer. If the Contractor removes the temporary cover in order to facilitate any other work, the temporary cover shall be replaced and secured by the contractor at no additional cost to the State.

Attention is directed to "Water Pollution Control" elsewhere in these special provisions.

The Contractor shall use temporary entrance/exit as one of the various measures to prevent water pollution. The Storm Water Pollution Prevention Plan shall graphically show the use of temporary entrance/exit in relation to other water pollution control work specified elsewhere in these special provisions.

MATERIALS.—Materials shall conform the following:

- A. **Subgrade Enhancement Fabric.**--Subgrade enhancement fabric shall be placed where shown on the plans and at locations designated by the Engineer in accordance with this special provision.

Subgrade enhancement fabric shall be manufactured from one or more of the following materials: polyester, nylon or polypropylene. Subgrade enhancement fabric shall be, at the option of the contractor, either a woven filament or nonwoven type fabric conforming to the following:

	Woven	Non-Woven
Weight, grams per Square Meter, Min. ASTM Designation: D3776	205	205
Grab Tensile Strength, Newtons (N), Min. ASTM Designation: D4632	890	800
Tensile Strength at 10% Elongation, N, Min. ASTM Designation: D4632	490	--
Elongation at Break, Percent, Max. ASTM Designation: D4632	35 Max.	50 Min.

Subgrade enhancement fabric shall be furnished in an appropriate protective cover which shall protect it from ultraviolet radiation and from abrasion due to shipping and handling, and shall remain in said cover until installation. Subgrade enhancement fabric shall be accompanied by a Certificate of Compliance conforming to the provision in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

- C. **Aggregate.**--Aggregate shall be uniformly graded angular rock or cobble ranging in size from 76.2 mm-180 mm. Rock shall be clean and free of organic matter and shall conform to the provisions in Section 26, "Aggregate Base," of the Standard Specifications and these special provisions.
- D. **Steel Corrugated Panels.**--Manufactured steel corrugated panels with raised bars shall be provided in individual sections. Steel plate and raised bars shall be a minimum 12.7 mm thick. Bars shall be a minimum of 38.1 mm in height and shall be uniformly distributed 190.5 mm apart longitudinally throughout the full section of each panel. Raised bars shall be welded to the bottom plate and approximately 12.7 mm thick at the base and tapering to 6.35 mm thick at the top of the bar. Each panel shall have a nominal dimension of 3 m X 2.43 m with an approximate weight of 1454 kg for each panel. Each end of the panel shall have a slot or hooked section to facilitate coupling at the ends.

INSTALLATION

Temporary entrance/exit and clean out sump shall be installed as shown on the plans and as follows:

- A. Prior to placing the subgrade enhancement, the areas shall be cleared of all trash and debris. Weeds shall be removed to the ground level. Cleared trash, debris, and removed weeds shall be disposed of outside the highway right of way in accordance with the provisions in Section 7-1.13 of the Standard Specifications.
- B. Subgrade enhancement fabric shall be handled and placed in accordance with the manufacturer's recommendation and shall be positioned longitudinally along the alignment, pulled taut to form a tight wrinkle-free mat. The subgrade to receive the fabric, immediately prior to placing, shall conform to the compaction and elevation tolerance specified in Section 25-1.03, "Subgrade", of the Standard Specifications and these special provisions and shall be free of loose or extraneous material and sharp objects that may damage the fabric during the installation.

Adjacent borders of the fabric shall be overlapped a minimum of 450 mm.

The amount of subgrade enhancement fabric placed shall be limited to that which can be covered with aggregate material within 72 hours.

Aggregate material to be placed directly over the subgrade enhancement fabric shall be spread in the direction of fabric overlaps. Stockpiling of materials directly on the subgrade enhancement fabric is not allowed. Once a sufficient working platform has been constructed, all remaining materials shall be uniformly placed and spread with 1:4 (V:H) tapers at the perimeter edges of the temporary entrance/exit where it conforms to existing roadway and in accordance with the applicable sections of the special provisions and the Standard Specifications.

During spreading of the aggregate material, vehicles or equipment shall not be driven directly on the fabric. A sufficient thickness of material shall be maintained between the fabric and the equipment to prevent damage to the fabric. Damage to the fabric resulting from the Contractor's vehicles, equipment, or operations shall be repaired at the Contractor's expense.

Should the fabric be damaged during placing, the damaged section shall be repaired by placing a new piece of fabric over the damaged area. Said piece of fabric shall be large enough to cover the damaged area and provide a minimum 900 mm overlay on all edges.

Steel corrugated panels shall be installed as shown on the plans. A minimum of 3 panel sections coupled to one another is required at each temporary entrance/exit. Prior to installing panels, the ground surface shall be cleared of all debris which may prevent uniform contact with the ground surface.

A clean out sump shall be installed as shown on the plans and located within 6 m of the entrance/exit facility. The sump shall be sized sufficiently to hold soil removed from the surfacing of the entrance /exit facility in order to maintain efficiency.

MAINTENANCE

The Contractor shall maintain the temporary entrance/exit and clean out sump throughout the contract period. The Contractor shall prevent displacement or migration of the aggregate surfacing or metal track panels. Any significant depressions, as determined by the Engineer, which form due to settling or heavy traffic shall be repaired by the Contractor.

Sediment and soil built up in the temporary entrance/exit surface which compromises the efficiency for sediment and soil removing capability shall be removed as necessary or as determined by the Engineer. Removal and disposal of sediment and soils from the entrance/exit and the clean out sump shall be the responsibility of the Contractor.

Once the temporary entrance/exit and clean out sump is no longer needed, the aggregate, subgrade enhancement fabric and any soil and sediments shall be removed and disposed of as provided for in Section 7-1.13, "Disposal of Material Outside of the Highway Right of Way," of the Standard Specifications. Following removal of the temporary entrance/exit and clean out sump, the areas shall be graded smooth and compacted to conform with adjacent areas.

PAYMENT

The contract lump sum price paid for temporary entrance/exit shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in placing, maintaining and removing temporary entrance/exit and clean out sump, complete in place, including transporting and disposing of soil and sediments removed from temporary entrance/exit and any incidental grading required to grade and compact areas within the limits of temporary entrance/exit and clean out sump as shown on the plans, as specified in these special provisions, and as directed by the Engineer.

Regardless of which type of temporary entrance/exit is installed (Type 1 or 2), each type shall be measured as a temporary entrance/exit.

10-1.36 TEMPORARY CONCRETE WASHOUT FACILITY

Temporary concrete washout facilities shall be constructed, maintained, and later removed as shown on the plans, in conformance with these special provisions and as directed by the Engineer.

Temporary concrete washout facilities shall be installed prior to beginning any placement of concrete and located a minimum of 15 m from storm drain inlets, open drainage facilities, and watercourses, unless determined infeasible by the Engineer. Each facility shall be located away from construction traffic or access areas to prevent disturbance or tracking.

A sign shall be installed as shown on the plans adjacent to each washout facility to inform concrete equipment operators to utilize the proper facilities.

Temporary concrete washout facilities shall be constructed above grade or below grade at the option of the Contractor. The minimum quantity of concrete washouts required for this project shall be 6.

Temporary concrete washout facilities shall be constructed and maintained in sufficient quantity and size to contain all liquid and concrete waste generated by washout operations for all concrete wastes. These facilities shall be constructed to contain all liquid and concrete waste without seepage, spillage or overflow.

MATERIALS

Materials used in the construction of temporary concrete washout facility shall conform to the following:

- A **PLASTIC SHEETING.**—Plastic sheeting shall be new and a minimum of 0.33 mm thick polyethylene sheeting and shall be free of holes, tears or other defects that compromise the impermeability of the material. Plastic sheeting shall not have seams or overlapping joints.
- B **ROCK BAG.**—Rock bag fabric shall be nonwoven polypropylene, with a minimum unit weight of 250g/m². The fabric shall have a mullen burst strength of at least 2500 kPa, per ASTM Designation: D3786 and an ultraviolet (UV) stability exceeding 70 percent at 500 hours. Rock bags shall have a length of 600 mm to 800 mm, width of 400 mm to 500 mm, thickness of 150 mm to 200 mm, and capable of containing a weighted mass of 13 kg to 22 kg. Rock bag fill material shall be non-cohesive, gravel, free from deleterious material. Rock bags shall be filled and the opening secured such that rock shall not escape from the bag.
- C **STRAW BALES.**—Straw for straw bales shall conform to the provisions in Section 20-2.06, "Straw," of the Standard Specifications.
Each straw bale shall be a minimum of 360 mm wide, 450 mm in height, 900 mm in length and shall have a minimum mass of 23 kg. The straw bale shall be composed entirely of vegetative matter, except for binding material.
Bales shall be bound by either wire, nylon or polypropylene string. Jute and cotton binding shall not be used. Wire shall be a minimum of 1.57 mm (16-gage) baling wire. Nylon or polypropylene string shall be approximately 2 mm in diameter with 360 N of breaking strength.
- D **STAKES.**—Stakes shall be 50 mm x 50 mm wood posts. Each stake shall have a minimum length of one meter.

TEMPORARY CONCRETE WASHOUT FACILITY (TYPE ABOVE GRADE)

Temporary concrete washout facility (type above grade) shall be constructed as shown on the plans with a minimum length of 3 m and a minimum width of 3 m. The length and width of a facility may be increased, at the Contractor's expense, upon approval of the Engineer.

TEMPORARY CONCRETE WASHOUT FACILITY (TYPE BELOW GRADE)

Temporary concrete washout facility (type below grade) shall be constructed as shown on the plans with a minimum length of 3 m and a minimum width of 3 m. The length and width of a facility may be increased, at the Contractor's expense, upon approval of the Engineer.

MAINTENANCE AND REMOVAL

Temporary concrete washout facilities shall be maintained to provide adequate holding capacity with a minimum freeboard of 100 mm for above grade facilities and 300 mm for below grade facilities. Maintaining temporary concrete washout facilities shall include removing and disposing of hardened concrete and returning the facilities to a functional condition. Hardened concrete materials shall be removed and disposed of in conformance with the provisions in Section 15-3.02, "Removal Methods," of the Standard Specifications. Minor holes and tears in the plastic sheeting may be taped as long as the repair does not compromise the impermeability of the material.

When temporary concrete washout facilities are no longer required for the work, as determined by the Engineer, the hardened concrete shall be removed and disposed of in conformance with the provisions in Section 15-3.02 of the Standard Specifications. Materials used to construct temporary concrete washout facilities shall become the property of the Contractor, shall be removed from the site of the work, and shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13 of the Standard Specifications.

Holes, depressions or other ground disturbance caused by the removal of the temporary concrete washout facilities shall be backfilled and repaired in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

PAYMENT

The contract lump sum price paid for temporary concrete washout facilities shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing, maintaining and removing temporary concrete washout facilities, complete in place, including straw bales, plastic lining, sign, portable delineators, lath and flagging, and excavation and backfill, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.37 AGGREGATE SUBBASE

Aggregate subbase shall be Class 4 and shall conform to the provisions in Section 25, "Aggregate Subbases," of the Standard Specifications and these special provisions.

The restriction that the amount of reclaimed material included in Class 4 aggregate subbase not exceed 50 percent of the total volume of the aggregate used shall not apply. Aggregate for Class 4 aggregate subbase may include reclaimed glass. Aggregate subbase incorporating reclaimed glass shall not be placed at locations where surfacing will not be placed over the aggregate subbase.

The percentage composition by mass of Class 4 aggregate subbase shall conform to the following grading requirements:

Grading Requirements (Percentage Passing)		
Sieve Sizes	Operating Range	Contract Compliance
6.3 mm	100	100
4.75-mm	30-65	25-70
75-µm	0-15	0-18

Class 4 aggregate subbase shall also conform to the following quality requirements:

Quality Requirements		
Test	Operating Range	Contract Compliance
Sand Equivalent	21 Min.	18 Min.
Resistance (R-value)	----	50 Min.

The provisions of the last 4 paragraphs in Section 25-1.02A, "Class 1, Class 2, and Class 3 Aggregate Subbases," of the Standard Specifications shall apply to Class 4 aggregate subbase.

At the option of the Contractor, Class 1 aggregate subbase conforming to the grading and quality requirements in Section 25-1.02A, may be used in place of Class 4 aggregate subbase. The restriction that the amount of reclaimed material included in Class 1 aggregate subbase not exceed 50 percent of the total volume of the aggregate used shall not apply. Aggregate for Class 1 aggregate subbase may include reclaimed glass. Aggregate subbase incorporating reclaimed glass shall not be placed at locations where surfacing will not be placed over the aggregate subbase. Once a class of aggregate subbase is selected, the class shall not be changed without written approval of the Engineer.

Regardless of the class of aggregate subbase supplied under the provisions of this section, payment for all aggregate subbase will be made as Class 4 aggregate subbase.

10-1.38 AGGREGATE BASE

Aggregate base shall be Class 3 and shall conform to the provisions in Section 26, "Aggregate Bases," of the Standard Specifications and these special provisions.

The restriction that the amount of reclaimed material included in Class 3 aggregate base not exceed 50 percent of the total volume of the aggregate used shall not apply. Aggregate for Class 3 aggregate base may include reclaimed glass. Aggregate base incorporating reclaimed glass shall not be placed at locations where surfacing will not be placed over the aggregate base.

Aggregate for Class 3 aggregate base shall conform to the following requirements:

Grading Requirements (Percentage Passing)

Sieve Sizes	Maximum	
	Operating Range	Contract Compliance
50-mm		
37.5-mm		
25-mm	100	100
19-mm	90-100	87-100
4.75-mm	35-55	5-35
600- μ m	10-30	5-35
75- μ m	2-11	0-14

Quality Requirements

Tests	Operating Range	Contract Compliance
Sand Equivalent	25 min	22 min
Resistance (R-value)		78 min
Durability	—	35 Min

The aggregate shall not be treated with lime, cement or other chemical material before the Durability Index test is performed. Untreated reclaimed asphalt concrete and portland cement concrete will not be considered to be treated with lime, cement or other chemical material for purposes of performing the Durability Index test.

10-1.39 TREATED PERMEABLE BASE

Treated permeable base shall be asphalt treated and shall conform to the provisions in Section 29, "Treated Permeable Bases," of the Standard Specifications.

10-1.40 ASPHALT CONCRETE

Asphalt concrete shall be Type A and open graded asphalt concrete shall conform to the provisions in Section 39, "Asphalt Concrete," of the Standard Specifications and these special provisions.

Open graded asphalt concrete may be placed when the atmospheric temperature is below 20°C, but above 7°C, provided the following requirements are met:

- A. The aggregate grading shall be 12.5-mm maximum.
- B. Open graded asphalt concrete shall not be placed in a windrow or stockpile. Open graded asphalt concrete shall be transferred directly from the hauling vehicle to the asphalt paver hopper.
- C. Open graded asphalt concrete shall be not less than 30 mm in compacted thickness.
- D. Immediately prior to adding the asphalt binder to the open graded asphalt concrete mixture, the temperature of the aggregate shall be not more than 135°C. Open graded asphalt concrete shall be spread at a temperature of not less than 105°C measured in the hopper in the asphalt paver.
- E. The compaction operation shall be such that the maximum distance between the asphalt paver and the initial breakdown rolling shall be no greater than 15 m.
- F. During the placement of open graded asphalt concrete, the speed of the asphalt paver shall not exceed 10 m per minute.
- G. The Contractor shall cover loads of open graded asphalt concrete with tarpaulins. The tarpaulins shall completely cover exposed open graded asphalt concrete in the hauling vehicle until the open graded asphalt concrete has been completely transferred into the asphalt paver hopper.

The grade of asphalt binder to be mixed with aggregate for Type OGAC asphalt concrete shall be PBA Grade 6a and shall conform to the provisions in "Asphalt" of these special provisions.

The amount of asphalt binder used in asphalt concrete placed in dikes, gutters, gutter flares, overside drains, miscellaneous area and aprons at the ends of drainage structures shall be increased one percent by mass of the aggregate over the amount of asphalt binder determined for use in asphalt concrete placed on the traveled way.

10-1.41 PILING

GENERAL

Piling shall conform to the provisions in Section 49, "Piling," of the Standard Specifications, and these special provisions.

Foundation recommendations are included in the "Information Handout" available to the Contractor as provided for in Section 2-1.03, "Examination of Plans, Specifications, Contract, and Site of Work," of the Standard Specifications.

The Contractor's attention is directed to the State's Retrofit of the existing Benicia Martinez Bridge and OH. As built pile driving records and installation data for the retrofit of the existing bridge are available for viewing at Caltrans Transportation Lab, 5900 Folsom Boulevard, Sacramento, California, Telephone (916) 227-7000.

The Contractor's attention is directed to "Seismic Monitoring System And Health Monitoring System Work" elsewhere in these special provisions for installation of conduits and sensors in cast-in-drilled-hole concrete piling. At Pier 8, the orientation of the reinforcing cage shall be maintained, as directed by the Engineer, while it is being inserted into the drilled hole so that the seismic monitoring tube remains properly positioned.

Rock cores are available for viewing at the Transportation Laboratory. The Contractor is encouraged to view the core samples of the bedrock from the State's test program prior to bidding. The samples are available for viewing at the Caltrans Office of Materials and Foundations, 5900 Folsom Boulevard, Sacramento, CA 95819 Telephone (916) 227-7047.

Attention is directed to "Welding Quality Control" and "Order of Work" of these special provisions and to the provisions in the Coast Guard "Preconstruction Checklist." Attention is also directed to "Seismic Monitoring Electrical System" for additional material installation within piles during pile construction. Attention is also directed to the requirements regarding changes in pile installation methods in "Load Test Pile" herein.

Proposals made by the Contractor to modify the specified tip elevations for the permanent steel casings or for the CIDH concrete piling (rock socket) shown on the plans will not be considered.

The specified tip of the permanent steel casing shall be considered to be the bottom of the permanent steel casing (without the driving shoe), as shown on the plans. The specified tip of the permanent steel casings will not be modified due to the length of the Contractor's driving shoe.

Proposals made by the Contractor to modify the specified pile installation methods will not be considered unless noted otherwise in these special provisions.

At the option of the Contractor, vibratory hammers, casing rotators or casing oscillators may be used to install temporary casings, corrugated steel pipes (isolation casings) or permanent steel casings at the locations listed in the following table:

Bridge Name or Number	Abutment Number	Pier Numbers
28-0153R	Abutment 1	2-17
Bridge Name or Number	Abutment Number	Bent Number

The Contractor's attention is directed to the requirements for vibration monitoring of the Rhodia facilities adjacent to Piers 2 and 3 should temporary casing be driven or vibrated into place.

Difficult permanent steel casing and drilled shaft installation is anticipated due to the presence of soft bay mud overlying dense soils, caving soils, hard bedrock, degradation of bedrock when exposed to water, soils that gain strength during delays in driving, marine traffic, hazardous and contaminated materials, tidal flow fluctuation, high ground water, cobbles and boulders, buried watersaturated logs, subsurface concrete debris, underground utilities, vibrations from Rail Road traffic, the requirements of permanent steel casing embedment into rock, and vibration monitoring.

The Contractor may not substitute a larger or smaller diameter or a thinner or thicker walled permanent steel casing for that shown on the plans. The dimensions and plate thicknesses of the permanent steel casings shall be as shown on the plans and substitutions will not be allowed.

PERMANENT STEEL CASING

General

Permanent steel casing shall consist of steel casing for cast-in-drilled-hole concrete piling. Permanent steel casings shall conform to the provisions in Section 49-5, "Steel Piles," of the Standard Specifications and these special provisions.

Attention is directed to "Falsework," of these special provisions for requirements concerning using permanent steel casings to support falsework for pier footing construction.

Wherever reference is made to the following American Petroleum Institute (API) specifications in the Standard Specifications, on the project plans, or in these special provisions, the year of adoption for these specifications shall be as follows:

API Codes	Year of Adoption
API 2B	1996
API 5L	1995

Permanent steel casing shall have driving shoes as indicated on the plans and as specified in these special provisions. The driving shoe thickness and length shall be designed by the Contractor based on the Contractor's proposed installation method and driving equipment but shall not be less than the minimum thickness and length shown on the plans. In addition, the outer diameter of the driving shoe shall not be greater than that of the permanent steel casing.

The 2.5 m permanent steel casing shall be positioned for installation using a template. If the Contractor elects to use a portion of the pier footing as a template for installing the casings, sufficiently rigid shimming or bracing shall be used to ensure that no relative movement occurs between the piles and the form template during placement of grout around the piles and of concrete into the footing. Where these special provisions allow splicing of the permanent steel casings, the Contractor shall make provisions to prevent the casing from running under its own weight and the weight of the Contractor's installation equipment, including, at a minimum, provisions to prevent the casing from penetrating below the top of the template or below water level. Attention is directed to "Precast Pier Footing Forms" elsewhere in these special provisions.

Permanent steel casing handling shall conform to the requirements in API RP2A "Recommended Practice for Planning, Designing, and Constructing Fixed Offshore Platforms." Working drawings for permanent steel casing handling shall include the following:

- A. Details and calculations demonstrating adequate support and stability for the casing with the full operating weight and dynamic loading of the proposed installation equipment.
- B. Provisions to provide stability and maintain alignment during placement of the casings and in wind, wave and current conditions.
- C. Provisions for providing adequate work space for casing welding, cutting and inspection.
- D. Provisions for ensuring the specified casing straightness, alignment, and support to prevent relative movement during field welding (where allowed) and to ensure that welding tolerances are met.
- E. Details and equipment used for handling of permanent steel casings including the use of temporary lifting or handling attachments and supporting brackets.
- F. Calculation of permanent steel casing stresses and deflections resulting from handling operations.

Six sets of the Contractor's template plans, casing handling plans and calculations shall be submitted to the Resident Engineer's Office at 757 Arnold Drive, Suite 200 Martinez, California 94553 at telephone number (925) 646-1996, for approval in accordance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. Template plans shall include complete calculations and details of the footing templates including all methods of support of the template, anticipated loads and stresses from casing installation, erection and removal details, as well as details of shimming or bracing for holding the piles secure during grouting into the footings. Design stresses for steel templates shall conform to Section 51-1.06A(2), "Design Stresses, Loadings and Deflections," of the Standard Specifications. If the plan calls for use of a portion of the concrete footing as a template, calculations shall include an analysis of the forces and stresses imposed on the footing during the installation of the piles. Stresses in portions of the concrete footings used as templates shall not exceed the allowable stresses in Section 8.15, "Service Load Method", of the Caltrans Bridge Design Specifications. Calculations and details shall be signed by an engineer who is registered as a Civil Engineer in the State of California.

The Engineer shall have 14 working days to review the template and casing handling submittal after a complete set has been received. Should the Engineer fail to complete the review within this time allowance and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in reviewing plan, the delay will be considered a right of way delay as specified in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

All requirements of the codes listed above shall apply unless specified otherwise in the Standard Specifications, on the plans or in these special provisions.

Handling devices may be attached to permanent steel casing. Welds attaching these devices shall be aligned parallel to the axis of the casing and shall conform to the requirements for field welding specified herein. All handling devices shall be removed from the permanent steel casing when no longer needed. All remaining welds shall be ground flush. Prior to making attachments, the Contractor shall submit a plan to the Engineer that includes the locations, handling and fitting device details, welding and removal procedures and connection details. Attachments shall not be made to the permanent steel casing until the plan is approved in writing by the Engineer. The Engineer shall have 7 working days to review the plan. Should the Engineer fail to complete the review within 7 working days, and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in reviewing the plan, the delay will be considered a

right of way delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

Each length of permanent steel casing shall be marked in conformance with the requirements in ASTM Designation: A 252.

For permanent steel casing, including bar reinforcement in the casing, the Engineer shall be allowed 5 working days to review the "Welding Report," specified in "Welding Quality Control" of these special provisions, and respond in writing after the required items have been received. No field welded permanent steel casing shall be installed, and no reinforcement in the casing shall be encased in concrete until the Engineer has approved the above requirements in writing. Should the Engineer fail to complete the review and provide notification within this time allowance, and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in notification, the delay will be considered a right of way delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

At the Contractor's option, a permanent steel casing may be re-tapped to prevent pile set-up; however, the field welded splice shall remain at least one meter above the work platform until that splice is approved in writing by the Engineer.

Fabricated Steel Pipe

Fabricated steel pipe is defined as pipe produced at a permanent facility where a variety of steel fabrication including roll forming and welding steel plate into pipe is performed, where this pipe is at least 19 mm in wall thickness, where this pipe is produced in conformance with API 2B, and where this fabrication can be done on a daily basis. Fabricated steel pipe is a specifically engineered product. (i.e., Fabricated steel pipe is engineered for a specific project.) Permanent steel casing shall be considered to be "Fabricated Steel Pipe."

Fabricated steel pipe used for permanent steel casing shall conform to API 2B and the following requirements:

- A. An API site license and API monogram are not required.
- B. Weld filler metal shall conform to the requirements of AWS D1.5 for the welding of AASHTO M270 Grade 345 (ASTM Designation: A 709, Grade 50) steel, except that the qualification, pretest, and verification test requirements need not be conducted if certified test reports are provided for the consumables to be used.
- C. Permanent steel casing shall be fabricated from AASHTO M270, Grade 345 (ASTM Designation: A 709, Grade 50) plate. Charpy V-Notch specimens for transverse orientations shall be removed and tested per ASTM A 673M, frequency H, and shall meet 27 joules average at +4C.
- D. Circumferential splices will not be allowed between sections of pipe in the locations shown on the plans.
- E. Gas Metal Arc Welding is prohibited.
- F. The welding filler materials (wire/electrode and flux, if used) shall be an essential variable for welding procedure qualification; i.e., any change in the filler material brand name or type shall require re-qualification of the welding procedure.
- G. Permanent steel casing shall conform to any additional requirements in the special provisions, including but not limited to, tolerances for diameter, edge alignment, roundness, and straightness, that are required in order to conform with steel pile splice welding and welding inspection provisions.
- H. Permanent steel casings shall be spliced in accordance with the requirements for steel pipe piles in Section 49-5.02, "Splicing," of the Standard Specifications and these special provisions and any additional amendments to AWS D1.1 listed herein.
- I. The preheat and interpass temperature shall be in accordance with AWS D1.1, Section 3.5 "Minimum Preheat and Interpass Requirements."
- J. Shear rings, stiffeners and stud connectors to be welded to permanent steel casing, as shown on the plans, shall conform to the provisions in Section 55, "Steel Structures," of the Standard Specifications, except that welding shall be in accordance with AWS D1.1 and these special provisions and studs longer than 200 mm need not be made up of 2 shorter studs. The shear rings and stiffeners shall be the same type and grade of steel as the permanent steel casings.
- K. The sulfur content of permanent steel casing shall not exceed 0.05 percent, except where through-thickness is designated on the plans. Where through-thickness is designated on the plans, steel shall conform to the low sulfur and 20% reduction of area requirements in AWS D1.5, Section 12.4.4.1.
- L. The acceptance criteria for visual inspection of permanent steel casing welds shall be AWS D1.1 criteria for statically loaded structures, except within the "No Splice Zone" designated on the plans, where the criteria for cyclically loaded structures subject to tensile stress shall apply.

Field Welding

Field welding of permanent steel casing is defined as welding performed after the certificate of compliance has been furnished by the manufacturer or fabricator. Except at Piers 6, 16 and 17, field welded splices will not be allowed for the

permanent steel casing in this contract. If permanent steel casing is damaged during installation and repair by splicing in a new section of casing is required, or if the Contractor plans to field splice permanent steel casing at Piers 6, 16 and 17, field welding shall conform to the following:

- A. Match marking of pipe ends at the manufacturing or fabrication facility is required for piling to ensure weld joint fit-up. Prior to positioning any 2 sections of steel pipe to be spliced by field welding, including those that have been match marked at the manufacturing or fabrication facility, the Contractor shall equalize the offsets of the pipe ends to be joined and match mark the pipe ends. If field cutting of the permanent steel casing is required, the cutting shall be by automated guided cutting equipment. Manual flame cutting shall not be used.
- B. Welds made in the flat position or vertical position (where the longitudinal pipe axis is horizontal) shall be single-vee or double-vee groove welds. Welds made in the horizontal position (where the longitudinal pipe axis is vertical or near vertical) shall be single-bevel or double-bevel groove welds. Joint fit-ups shall conform to the requirements in AWS D1.1 and these special provisions.
- C. All full thickness welds shall be made from both sides.
- D. For steel pipe with an outside diameter greater than 1.1 m, and with a wall thickness greater than 25.4 mm, the root opening tolerances may be increased to a maximum of 5 mm over the specified tolerances.
- E. Weld filler metal shall conform to the requirements shown in AWS D1.5, Table 4.1 or 4.2, for the welding of AASHTO M270 Grade 345 (ASTM Designation: A 709, Grade 50) steel, except that the qualification, pretest, and verification test requirements need not be conducted if certified test reports are provided for the consumables to be used. Low hydrogen electrodes, defined as those with H4, H8 and H16 designators assigned by the filler metal manufacturer, shall be used.
- F. For field welding, including making repairs, the preheat and interpass temperature shall be in conformance with AWS D1.1, Section 3.5, "Minimum Preheat and Interpass Temperature Requirements," and with Table 3.2, Category C; and the minimum preheat and interpass temperature shall be 66°C, regardless of the pipe pile wall thickness or steel grade. In the event welding is interrupted, preheating to 66°C must occur before welding is resumed. For welds with required preheat temperatures greater than 66°C, preheat temperatures shall be achieved and maintained using electric resistance heating bands for the entire length of the weld. The heaters shall be controlled by attached thermocouples at spacings not exceeding 2 m. For these welds, the minimum preheat temperature shall be maintained continuously from beginning to completion of the entire weld, even if welding is interrupted.
- G. Welds shall not be water quenched. Welds shall be allowed to cool unassisted.
- H. The Contractor shall provide durable enclosures at field splice locations to allow welding during inclement weather conditions.
- I. Prequalified welding procedures will not be permitted for permanent steel casing splices. All field welding procedures shall be qualified by testing in conformance with the requirements in AWS D1.1 and these special provisions. Using the qualified WPS, a minimum of two additional weld mock-ups shall be required to qualify field welding of permanent steel casings. All mock-up welding shall be performed outside in the enclosure that will be used during actual casing installation. Both welds shall be made in the horizontal position. Each weld need not exceed 1 m in length, and all passes shall be stopped and restarted at the same location in the middle of the weld. The first weld shall be prepared and welded using the proposed production weld joint detail and welding parameters. The second weld shall simulate the most onerous combination of weld root opening, root face gap anticipated for field fit-up, as agreed with the Engineer. The out-of-tolerance fit-up shall be repaired and accepted per these specifications before completing the weld. The completed welds shall be examined by the ultrasonic testing (UT) procedure proposed for production joints, and any significant indications shall be marked for sectioning to confirm the UT results prior to mechanical testing the weldment. Qualification tests shall include all tests required by AWS D1.1, macroetch sections of the center stop-start location and all areas marked during UT, and Charpy V-Notch tests at -18°C of the weld metal and heat affected zone. The tests shall meet 27 Joules minimum average and 20 Joules minimum individual.
- J. Stray current corrosion of the structure shall be avoided during field welding.. Where it is not practical to place the welding machines on the structure being welded, the insulated welded power source output "ground" lead shall be connected directly to the work at a location close to the weld being made and shall not be permitted to touch the water. The minimum total cross sectional area of the return ground cable(s) shall be 645 circular mm per 1000 amperes per 30.5 m of cable. Grounding sufficiency shall be periodically monitored by simultaneously measuring the potential of the structure being welded and that holding the welding machines using a standard calomel electrode (SCE), Ag-AgCl or other reference electrode approved by the Engineer. Any change in potential reading of the structure being welded of more than 10% shall indicate insufficient grounding.

Cleaning

Permanent steel casing shall be cleaned of all foreign material, including residue from drilling operations, prior to placement of concrete. Cleaning shall be performed while the slurry head is maintained on the pile as specified in these special provisions. Cleaning shall be by brushing, pressure jetting or equivalent methods as approved by the Engineer. Equipment or methods used during casing cleanout shall not cause blow-ins, scouring, or caving around or below the tip of the steel casing. The Contractor shall notify the Engineer prior to beginning cleaning operations on each pile. At the completion of cleaning, the Contractor shall demonstrate to the Engineer that the walls of the casing have been thoroughly cleaned. No reinforcing shall be placed in the pile until the cleaning performed is approved by the Engineer.

NONDESTRUCTIVE TESTING FOR PERMANENT STEEL CASING

Permanent steel casing shall receive nondestructive testing (NDT) in conformance with these special provisions.

Nondestructive Testing of Welds made at the Fabrication Facility, acceptance per Bay Bridge 1/17/2001

Twenty-five percent of each longitudinal weld made at a permanent fabrication facility shall receive NDT. One-hundred percent of all circumferential welds shall receive NDT. If repairs are required in a portion of the weld not required to be 100 percent examined, additional NDT shall be performed using the same method as used in the original testing. The acceptance and repair criteria shall conform to the requirements in AWS D1.1, Section 6, for statically loaded structures under tensile stress, except within the "No Splice Zone" designated on the plans, where the criteria for cyclically loaded nontubular connections subject to tensile stress shall apply. The additional NDT shall be made on both sides of the repair for a length equal to 10 percent of the length of the pipe outside circumference. After the additional NDT is performed, and if more repairs are required that have a cumulative weld length equal to or more than 10 percent of the length of the pipe outside circumference, then the entire weld shall receive NDT by the same method as used in the original testing.

Circumferential welds shall receive NDT by either radiographic, radiosopic, real time imaging systems, or ultrasonic methods that are in conformance with the requirements in AWS D1.1. When a radiosopic or real time imaging method is used for inspection of these welds, the fluoroscope shall be evaluated in conformance with the requirements in API 5L, Section 9.7.3.8, "Procedure for Evaluating In-Motion Operation of a Fluoroscope."

Nondestructive Testing of Field Welds

Personnel performing ultrasonic testing (UT) for field welds will be required to verify their qualifications prior to performing nondestructive testing by both written and practical exams. Information regarding these exams is available at the Transportation Laboratory.

UT shall be performed in accordance with a written procedure that shall be reviewed by the Engineer before use. The UT procedure shall address the unambiguous interpretation of indications from the weld root and backing and shall describe the treatment of root fit-up repairs. The procedure shall define all measurements and/or marking that may be required prior to the start of welding. This procedure shall be demonstrated during weld procedure qualification to verify its effectiveness in differentiating root and repair conditions.

All field welds on permanent steel casing shall receive either 100% ultrasonic testing (UT) or 100% radiographic testing (RT) in accordance with AWS D1.1 requirements for welds in tension. This 100% NDT shall be used for each field weld, including welds that are made onto a portion of the steel pipe piling that has been installed and any repair made to a splice weld. In addition, Magnetic Particle testing (MT) shall be used for 100% of the root pass of all field welds unless otherwise directed by the Engineer. The acceptance criteria shall conform to the requirements in AWS D1.1, Section 6, for statically loaded nontubular connections subject to tensile stress. UT shall be performed in accordance with a written procedure that shall be reviewed by the Engineer before use. The UT procedure shall address the unambiguous interpretation of indications from the weld root and shall describe the treatment of root fit-up repairs. The procedure shall define all measurements and/or marking that may be required prior to the start of welding. This procedure shall be demonstrated during weld mock-up qualification to verify its effectiveness in differentiating root and repair conditions.

Jetting and Drilling

Jetting or drilling to obtain the specified penetration in conformance with the provisions in Section 49-1.05, "Driving Equipment," of the Standard Specifications shall not be used for driven type permanent steel casing.

Permanent steel casing may be driven, vibrated, rotated or oscillated into under sized drilled holes in conformance with the provisions in Section 49-1.06, "Predrilled Holes," of the Standard Specifications at the locations and in accordance with the requirements shown in the following table:

Bridge Name or Number	Undersize Hole Size	Pier Number	Elevation of Bottom of Hole
Benicia Martinez Bridge and OH	Inside diameter of permanent steel casing minus 300 mm	5 through 9, 11 through 17	No more than two times the casing diameter below the casing at any time, except not lower than the specified tip of the permanent steel casing, and no more than 500 mm below the casing without slurry being used
Benicia Martinez Bridge and OH	Inside diameter of permanent steel casing minus 300 mm	10	No more than one times the casing diameter below the casing at any time, except not lower than the specified tip of the permanent steel casing, and no more than 500 mm below the casing without slurry being used

PERMANENT STEEL CASING OSCILLATION, ROTATION AND VIBRATION

If the Contractor chooses to oscillate, rotate or vibrate the permanent steel casing into place, the driving shoe shown on the plans may be eliminated, at the option of the Contractor, and upon approval by the Engineer of the Contractor's proposed installation method by non-driving methods and upon satisfactorily completing the test pile using the same proposed method. If the Contractor's non-driving permanent steel casing installation method involves modifying the bottom of the permanent steel casing in any way, the details shall be submitted to the Engineer for approval. Teeth or other attachments at the pile tip may not extend further than 13 mm outside the outer diameter of the permanent steel casing.

Load Test Pile

The Contractor shall install a load test pile and perform a pile load test in accordance with the details on the plans and these special provisions. All the requirements in these special provisions for the production piles shall also apply to the load test pile, unless otherwise approved by the Engineer in writing.

The Contractor shall notify the Engineer, in writing, not less than 10 days in advance of installing the permanent steel casing portion of the load test pile and 10 days in advance of performing the pile load test.

The methods of installation of the load test pile shall be the same as those to be used on the production piling. Should the Contractor use a significantly different installation method for the production piling than was used for the load test pile (as determined by the Engineer), the load test shall be repeated on a new pile, at a new location, as directed by the Engineer, and at the Contractor's expense, using the new method. Additional grout repair tubes, as shown on the plans for the production piling, will not be required for the load test pile(s). Expansion couplings, with a capacity of 150 mm, shall be provided for all gamma test tubes and shall be located between the bearing plates of the load cells or as directed by the Engineer.

Section 49-1.04, "Load Test Piles," of the Standard Specifications shall not apply.

A qualified representative of the manufacturer of the load cells shall be present at the job site during the installation of load cells, during concrete placement and during testing of the load test pile.

Load testing shall consist of furnishing and installing load cells, performing load tests, providing load test reports, and obtaining the Engineer's approval of load test reports for the load test pile, as shown on the plans, as specified in these special provisions, and as directed by the Engineer. Load testing shall include furnishing all materials and labor necessary for conducting a bi-directional load test at the load test pile, including instrumentation, and reporting the results. The bi-directional load test shall be used to test the side shear resistance of the load test pile by separately measuring the upward and downward movements of the load test pile. Bi-directional load testing shall be conducted using hydraulically activated sacrificial load cells capable of the full separation of the upward and downward side shear. The load cells shall be embedded in the load test pile as shown on the plans. During loading, separate load-movement curves shall be obtained for both the upward and downward side shear components. For this test, all reactions shall be provided by the in situ soil or rock.

The load test shown on the plans is intended to be a two-stage test such that side friction information is obtained for both the upper and lower portions of the rock socket and for the permanent steel casing. The two stages are described in more detail below:

1. In the first stage, friction values for the lower portion of the rock socket are obtained by activating the load cells and then collapsing the compressible material below the specified tip of the pile. Whether or not the ultimate capacity of the lower portion of the rock socket is achieved, the first stage test shall be stopped before the lower portion of the shaft moves more than 75 mm. If the ultimate capacity is reached before the lower portion has moved 75 mm, then the load application shall continue until the lower portion has a displacement of 75 mm. At this point, the plastic gamma tubes

shall be drilled out at the pile tip, the tip shall be washed out with pressurized salt water from tube to tube. Finally, grout shall be pressure injected at the pile tip.

2. In the second stage, with the development of end bearing below the tip, friction values are determined in the upper portion of the rock socket and for the permanent steel casing. Strain gages located near the interface between the rock socket and the end of the casing allow differentiation between the friction achieved in the upper portion of the rock socket from that of the permanent steel casing.

As a minimum, instrumentation shall include displacement transducers to measure the expansion of the load cells and telltales for measurement of the elastic compression of the portions of the load test pile above and below the load cells and the side shear movement of the load test pile above and below the load cells. All data acquisition, including expansion of load cells, displacement telltales, hydraulic transducers, and strain gages, shall be automated by connecting all data acquisition instruments through a multiplexer to a data logger, and connected to a computer, so that an ASCII format data file with all applicable test data including time stamp will be available at the completion of the load test. A minimum of 4 strain gages shall be located at each cross section in the pile where load determination is required. A minimum of eight levels (cross sections) shall have strain gages to determine the load at that level.

Tip Washout and Grouting.—Tip washout and grouting shall occur after the completion of the first stage of the load test. Pipe caps at the ends of the gamma tubes shall be drilled out sequentially around the circumference of the test pile. Washout shall be performed from adjacent hole to adjacent hole sequentially around the circumference of the pile. Water shall be pumped into one tube and out of no more than two adjacent tubes at a time. Washout shall continue in each hole until the water coming out of the return pipe(s) runs clear. Pneumatic pipe packers placed at the bottom of the pipe near the specified tip shall be used to seal the gamma tubes as washout and grouting proceeds from hole to hole. Water pumping equipment shall be capable of generating a water pressure of at least 2756 kPa (measured at the top of the pile on the input line) at a flow rate of 378 liters per minute. Grout for pressure grouting shall consist of mixture of microfine Type V Portland cement, additives and water. Additives shall include a set retarder to extend the setup time and a dispersant to prevent flocculation. Microfine cement shall have a cement fineness measured in accordance with the Blaine air permeability test (ASTM C-204) of at least 10,000 cm²/g (1000 m²/kg). The water to dry grout ratio shall be 0.8/1.0 by weight of dry grout mix. Grout shall be injected at a minimum pressure of 5515 kPa (measured at the top of the hole on the injection line), until refusal. Refusal shall be defined as no more than one-tenth of a cubic foot of grout per minute for 10 minutes. Grout shall be injected into at least three of the holes equally spaced around the circumference of the pile. The three inner gamma holes shall be used to vent the grouting operation. As necessary to maintain the required pressures during grouting, steel pipes with packers shall be inserted into the PVC pipes (since the PVC pipe is not rated for such high pressures). Pipes shall be equipped with valves to be able to shut off and hold the grout once refusal is met. If refusal is not met upon initial grouting, a secondary grouting shall be performed.

Working Drawings.--The Contractor shall submit working drawings for the load test pile construction to the Resident Engineers Office, in accordance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. For initial review, 6 sets of such drawings shall be submitted. After review, between 6 and 12 sets, as requested by the Engineer, shall be submitted to the said Office for final approval and for use during construction. Working drawings shall contain details of the Contractor's proposed methods for construction of the load test pile as described in these special provisions, including methods for installation of the permanent steel casing, methods for drilling and cleanout of cast-in-drilled-hole portions of the load test pile; details of strain gage protection, instrumentation device locations, access opening locations, sizes and patterns, and a description of the method for placing concrete in the load test pile; and calculations showing load transfer at the top and bottom bearing plates or equivalent truss at the cell assembly. Working drawings shall also contain details and calculations for the pile-supported load test platform. Said working drawings shall be signed by an engineer who is registered as a Civil Engineer in the State of California.

Construction of the load test pile shall not proceed until the working drawing submittal has been approved in writing by the Engineer.

The Contractor shall allow 14 working days after complete drawings and all support data are submitted to the Engineer for the review of any working drawings for load test pile construction.

Should the Engineer fail to complete his review within the time allowed and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in working drawing review, the delay will be considered a right of way delay as specified in Section 8-1.09, "Right of Way Delays" of the Standard Specifications.

Construction. --In addition to the useful geotechnical data that will be obtained from the pile load test, construction of the load test pile is intended for the Contractor to demonstrate to the Engineer that the installation methods and equipment proposed for use on the production piling are capable of successfully installing the piles in accordance with the details on the plans and the requirements of these special provisions. The load test pile shall be constructed in conformance with all the requirements in these special provisions for the production 2.5 m permanent steel casing, the 2.5 m cast-in-drilled-hole

concrete piling, and the 2.2 m cast-in-drilled-hole concrete piling (rock socket) including, but not limited to, all concrete mix design requirements, testing requirements (including sonic logging of the hole) and driving system submittal requirements (if the production permanent steel casings are to be driven).

The Contractor shall provide a template of adequate strength and stiffness for the installation of the permanent steel casing, such that the required vertical alignment within the casing is maintained during installation.

A compressible end bearing device shall be used at the bottom of the pile at the end of the reinforcing cage. The device shall consist of two steel plates separated by 50-75 mm of compressible material supplied by the manufacturer of the load cells. The inspection tubes shall pass through holes in both plates of the compressible end bearing device to allow for later grouting at the pile tip. The bar reinforcing cage shall be held at the proper elevation during placement of the concrete into the pile to prevent crushing of the compressible end bearing device.

The installation of the load cells and all related testing instruments and equipment shall be performed as recommended by the manufacturer of the load cells, and as approved by the Engineer.

The load cells and pile movement measuring instruments shall be capable of applying the loads required and making all measurements necessary for conducting a bi-directional load test of the load test pile, under the conditions shown on the plans, and in conformance with the requirements of these special provisions. Such equipment shall be of a configuration that will allow the satisfactory construction of the load test pile by the specified methods, with the load cells and instruments in place in the work.

The load cell assemblies to be provided shall have a capacity of at least 81 MN, in each direction, for a total test capacity of 162 MN. The load cells shall be equipped with all components needed to compute deflection and capacity, including hydraulic lines, fittings, pressure source, pressure gage, displacement telltales, hydraulic transducers, strain gages, and automated data gathering and reporting equipment.

LOADTEST, Inc., the manufacturer and supplier of Osterberg cells, is the only supplier of load cells and technical assistance for this testing procedure that is known to the State. Load cells shall consist of Osterberg cells, or equal. Such cells are available from:

LOADTEST, Inc.
2631-D NW 41st Street
Gainesville, FL 32606
(800) 368-1138

or

LOADTEST, Inc.
5420 S. Klee Mill Road, Suite 4
Sykesville, MD 21784
(800) 436-2355

LOADTEST, Inc. has agreed to furnish the loading devices and other equipment and services described in these special provisions at the guaranteed prices as follows:

Item	Price Per Test
Furnish Load Test Cell Assembly and Perform Load Test	\$182,700

The above prices include delivery of materials to the job site, and will be guaranteed to any bidder ordering such materials and services prior to December 31, 2001, provided delivery is accepted within 90 days after the order is placed. For orders after January 1, 2002 and before December 31, 2002 the above guaranteed price per test shall be increased by 5% for inflation.

Other equipment and services to be provided by LOADTEST, Inc., included in the above prices, are as follows:

1. Technical advice and direction during construction of the load test pile, including the installation of the load cells with all associated measuring instruments.
2. Services of a qualified Geologist or Civil Engineer who is registered in the State of California.
3. Operation of the hydraulic pressure pump during load testing and recording of load test data.
4. Furnishing, installing, and testing of all test instruments, including related conduits and wiring, which will be embedded in the load test pile (except telltale casing and vent pipe).
5. Submittal of all test data and a final report to the Engineer.
6. Compressible material for end bearing device

7. Hydraulic pumps, fluids, and supply lines as needed to operate the load cells.
8. Instrumentation tubes and telltales.
9. Strain gages, LVDTs (Linear variable differential transformer) and LVWDTs (Linear vibrating wire displacement transducers).

The Contractor shall furnish all materials, equipment, and labor necessary to instrument and test the load test pile, in addition to that which is supplied by the manufacturer of the load cells. This includes the following:

1. Potable water from an approved source to mix with a water-soluble oil provided by manufacturer of the load cells.
2. A stable reference beam system for monitoring movements of the top of the load test pile during testing. A self-leveling, surveyors level and operator shall be provided to monitor the reference system.
3. A protected work area (including provisions such as a tent or shed for protection from inclement weather for the load test equipment and personnel) of size and type required by the Engineer and the manufacturer of the load cells.
4. Electric power, as required for lights, welding, instruments, etc.
5. Materials for carrier frame, steel angles, steel bearing plates or equivalent truss system, tell tale casing (250 meters of 13 mm black iron or galvanized pipe), vent pipe (120 meters of 19 mm PVC with bell ends) and/or other devices needed to adapt the load cells to the bar reinforcing steel cage of the load test pile.
6. Steel end plates for compressible end bearing device and top and bottom bearing plates for the load cells (two 50 mm thick and two 15 mm thick, with diameters as shown on the plans).
7. Welding equipment, materials, and certified welding personnel, as required, to assemble the test equipment under the supervision of the manufacturer of the load cells, attach hydraulic fittings and telltales to the load cells, and prepare the work area.
8. Equipment and labor to construct the bar reinforcing steel cage and/or placement frame including any steel plates or trusses required for the load test pile.
9. Equipment and operators for handling the load cells, instrumentation and placement frame, bar reinforcing steel cage during the installation of the load cells and during the testing, including a crane or other lifting device, labor, and hand tools as required by the manufacturer of the load cells and the Engineer.
10. Equipment and labor sufficient to erect the protected work area, and reference beam including equipment capable of holding the bar reinforcing cage off of the bottom of the hole during concrete placement.
11. Air compressor (minimum 150 cfm) for pump operation during load testing.
12. Equipment and labor to plug and drill out the end caps the gamma tubes, to washout/flush the areas at the tip to be pressure grouted, and to pressure grout using a ultrafine Portland cement grout mixture.

Load testing (Stage 1) of the load test pile shall not begin until the concrete has attained a compressive strength of 25 MPa as approved by the Engineer. Stage 2 load testing shall not begin until the injected grout at the pile tip has cured for a minimum of 5 days.

The load cells, hydraulic supply lines and other attachments will be assembled and made ready for installation under the direction of manufacturer, in a suitable area, adjacent to the load test pile, to be provided by the Contractor. The load cell assembly shall be welded to the bottom of the upper cage and to the top of the lower cage in conjunction with the construction of the cage.

The Contractor shall use the utmost care in handling the placement of the test equipment assembly so as not to damage the instrumentation or the bar reinforcing steel during installation. The Contractor shall limit the deflection of the bar reinforcing steel cage between pick points while lifting the cage from the horizontal position to vertical. The Contractor shall provide support bracing and strong backs as necessary to minimize the deflections between pick points and to prevent damage to the instrumentation or the bar reinforcing steel.

After placement of the bar reinforcing steel, load cells, and all instrumentation for the load test pile, the load test pile shall be concreted. Strain gages shall be located as approved by the Engineer.

The load test pile shall be constructed with the use of synthetic slurry in accordance with these special provisions. Testing for defects in the CIDH shall be completed and all anomalies mitigated, before beginning the pile load testing.

At least 12 concrete test cylinders shall be made from the concrete used in the load test pile. Testing of cylinders shall be by the Contractor's independent laboratory, results shall be reported to the Engineer within 24 hours of each test performed. At least two of these test cylinders shall be tested for compressive strength prior to the load test and at least 2 cylinders shall be tested on the day of the load test. In addition, the modulus of elasticity of the concrete shall be determined by testing two cylinders each at 3 and 7 days after placement and two on each of the two days of testing (stage one and stage two testing). Elastic modulus testing shall be in accordance with the requirements of ASTM C 469, and the cylinders shall be moist cured until testing.

Testing and Reporting.--The load testing shall be performed by a qualified Geologist or Civil Engineer who is registered in the State of California, as provided by the manufacturer of the load cells.

The load testing shall be performed in general compliance with the requirements of ASTM Designation: D 1143 (Quick Test Method). Initially the loads shall be applied in increments equaling 5 percent of the design load specified herein. The magnitude of the load increments may be increased or decreased depending on actual load test pile capacity, and as approved by the Engineer.

Direct movement indicator measurements shall be made of the following: cell expansion (4 LVWDTs per cell assembly), top of load test pile movement (3 LVDTs or digital dial gages), and continuous compression measurements of the load test pile in 3 zones (3 LVWDTs per zone.)

Loads shall be applied, as determined by the Engineer, until the ultimate capacity of the load test pile is reached in side shear, or until the maximum capacity or maximum stroke of the load cells is reached, unless otherwise directed by the Engineer.

The load test procedure shall be as follows:

1. Construct the load test pile as shown on the plans. Place 7 sets of 4 strain gages (28 total) along the reinforcing steel cage of the rock socket as recommended by the manufacturer and as approved by the Engineer.
2. Load the bottom of the load test pile by pressurizing the load cell assembly to determine the ultimate side shear capacity of the bottom section of the load test pile. Design load of the bottom section of the load test pile is estimated to be 26,200 kN, after taking into account the pile buoyant weight.
3. Flush and washout the tip of the pile using the gamma tubes and high pressure water. Pressure grout below the pile tip, allow grout to cure 5 days.
4. Load the top section of the load test pile by pressurizing load cell assembly to test the ultimate side shear capacity of the upper section of the load test pile. Design load of the upper section of the load test pile is 31,522 kN, after taking into account the pile weight.
5. Determine the capacity of the steel shell by checking the strains in the steel shell at appropriate points.

At each load increment movement, indicators shall be read at the 0.0, 1.0, 2.0 and 4.0 minute intervals while the load is held constant.

Dial gages, digital gages, or LVWDTs used to measure end and side shear movement shall have a minimum travel of 150 mm and be capable of being read to the nearest 0.0025-mm division. End movement may be alternately monitored using LVWDTs capable of measuring the expansion of the loading device (150 mm).

The reference beam selected shall have a minimum length of 15 m and shall be firmly supported on poured reinforced concrete foundations. The reference beam elevations shall be monitored and recorded at all times during testing through the use of electronic surveying instruments.

The Contractor shall supply 8 copies of a report of each load test, as prepared by the manufacturer of the load cells or by others approved by the Engineer.

A preliminary report containing the load-movement curves and test data shall be provided to the Engineer within 5 days after the completion of each load test, to allow evaluation of the test results.

After the receipt of the preliminary report, the Contractor shall allow 5 working days for the Engineer to review the preliminary report and provide comments.

A final report that contains all preliminary reports, the Engineer's comments and the Contractor's replies to the comments on the load testing shall be submitted to the Engineer within 2 weeks after completion of all pile load testing.

Removal.--After completion of testing, all load test piles, materials, and equipment shall be removed to elevation +1.5 m, minimum, and shall be disposed of. The load test pile shall be removed in accordance with the provisions in Section 15-4.02, "Removal Methods," of the Standard Specifications. The load test platform shall be completely removed. All removed materials shall become the property of the Contractor and shall be disposed of outside the highway right of way in accordance with the provisions in Section 7-1.13 of the Standard Specifications.

Dynamic Monitoring

Driven 2.5 m permanent steel casing at 2.5 m CIDH concrete piling will be monitored during the final 8 m of driving for dynamic response to the driving equipment as specified in these special provisions. Four (4) permanent steel casings shall be monitored for the purpose of verifying that the Contractor's driving hammer is not damaging the casings. The first permanent steel casing driven (includes the load test pile) shall be dynamically monitored, in addition, the first driven permanent steel casings at Piers 6 and 10 shall be dynamically monitored. The fourth location shall be randomly selected by the Engineer. If the Contractor elects not to drive the permanent steel casing at Piers 6 and 10, but elects to drive casing at other piers, then the first casings at the first two other piers constructed shall be monitored. Monitoring will be done by State forces using State-furnished dynamic pile analyzer monitoring instruments. All permanent steel casings to be monitored shall be provided with an extra 4.0 meters of casing length above the cut-off elevation of the casing. The extra length shall be cut off at the completion of monitoring. The cut off section of casing shall become the property of the Contractor and shall be disposed of

in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

The Contractor shall provide electric power (120-volt, 60 cycles stable power) for the State's monitoring equipment, including access to the piles and working space and shelter for State monitoring personnel.

Permanent steel casing to be dynamically monitored shall be made available to State forces 2 working days prior to driving. The permanent steel casing shall be safely supported a minimum of 150 mm off the ground in a horizontal position on at least 2 support blocks. The permanent steel casing shall be positioned so that State forces have safe access to the entire permanent steel casing length and circumference for the installation of monitoring equipment anchorages and control marks for monitoring. Three 5.6-mm diameter holes shall be drilled and tapped at the upper end of the permanent steel casing at 4 equal spaces around the pile perimeter at the Engineer's direction. Where the Contractor elects to install permanent steel casing at Piers 6, 16 and 17 in sections, and one of these casing is selected for monitoring, each upper section, as directed by the Engineer, shall be drilled and tapped as specified herein. The Contractor shall rotate the permanent steel casing on the blocks as directed by the Engineer.

Permanent steel casing to be dynamically monitored shall be prepared and driven in the following sequence:

- A. Prior to driving, the Contractor shall rotate and align the permanent steel casing in the driving leads as directed by the Engineer
- B. The Contractor shall temporarily suspend driving operations for approximately 30 minutes when the permanent steel casing tip is 8 m above the elevation to which the tip is required to be finally driven, or when the permanent steel casing tip first reaches rock, as determined by the Engineer.
- C. During the 30 minute suspension, the Contractor shall bolt the 0.5-kg instrument package securely to plugs or expansion anchors previously installed in the permanent steel casing by the State. The Contractor shall connect electrical cables to the instrument package as directed by the Engineer.
- D. Driving operations shall resume as directed by the Engineer.
- E. The Contractor shall remove the cables and instrument package from the permanent steel casing and deliver them to the Engineer.

The Contractor shall be responsible for damage to the State's cables and instruments caused by the Contractor's operations, and shall replace damaged cables or instruments in kind.

Should the results of any dynamic monitoring test by the Engineer indicate stresses of more than 95 percent of the specified yield strength of the permanent steel casing, all pile driving at that pier footing shall immediately stop and the Contractor shall resubmit the driving system submittal for that footing with modifications of the driving method and explanations for the excessive stresses. In addition, if in the opinion of the Engineer, similar conditions may lead to excessive stresses at other locations in different footings, the Engineer may elect to monitor up to 4 additional permanent steel casings. In this situation, when the casings have already been fabricated, the additional stickup length shall be added by welding on a 4 meter length of casing above the top of the pile in accordance with "Field Welding " of these special provisions.

The time required for the Contractor to install and remove the cables and instrument package from the permanent steel casing and/or permanent steel casing sections shall not constitute a delay to the Contractor's operations.

Driving System Submittal

Prior to installing driven permanent steel casing , the Contractor shall provide a driving system submittal, including driveability analysis, in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. A submittal shall be made for each control location shown below. All proposed driving systems (i.e., each hammer that may be brought onto the site) shall be included in the submittal.

Pier Number	Control Location
Pier 6	A
Pier 7	B
Pier 8	C
Pier 9	D
Pier 10	E
Pier 11	F
Pier 12	G
Pier 13	H
Pier 14	I
Pier 15	J
Pier 16	K
Pier 17	L
Load Test Pile	M

The driving system submittal shall contain an analysis showing that the proposed driving systems will install permanent steel casing through bedrock to the specified tip elevation . Driving systems shall generate sufficient energy to drive the piles with stresses not more than 95 percent of the specified yield strength of the permanent steel casing . Submittals shall include the following:

- A. Complete description of soil parameters used, including soil quake and damping coefficients, skin friction distribution, , assumptions made regarding the formation of soil plugs, and assumptions made regarding drilling through the center of permanent steel casings.
- B. List of all hammer operation parameters assumed in the analysis, including manufacturer's rated energy, fuel settings, stroke limitations, and hammer efficiency.
- C. Driveability studies that are based on a wave equation analysis using a computer program that has been approved by the Engineer. Driveability studies shall model the Contractor's proposed driving systems, including the hammers, capblocks, and pile cushions, as well as determine driving resistance and pile stresses for assumed site conditions. Separate analyses shall be completed at elevations above the specified tip elevations where difficult driving is anticipated. Studies shall include plots for a range of permanent steel casing compression capacities and shall be done for both plugged and unplugged conditions . Plots shall include the following:
 1. Permanent steel casing compressive stress versus blows per 0.30-m.
 2. Permanent steel casing tensile stress versus blows per 0.30-m.

When the driveability analysis hammers indicate that permanent steel casing penetration rates are less than 0.30-m per 200 blows and the driving stresses will exceed 80 percent of the specified yield strength of the permanent steel casing, the study shall include assumptions for drilling through the center of permanent steel casing if center relief drilling is utilized.

- D. Copies of all test results from any previous pile load tests, dynamic monitoring, and all driving records used in the analyses.
- E. Completed "Pile and Driving Data Form," which is shown in these special provisions.

The driving system submittal shall be stamped and signed by an engineer who is registered as a Civil Engineer in the State of California. Prior to installing piling, the Contractor shall allow the Engineer 15 working days to review a driving system submittal after a complete set, as determined by the Engineer, has been received. Should the Engineer fail to complete his review within the time allowance, and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in the driving system submittal review, the delay will be considered a right of way delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays" of the Standard Specifications.

The Contractor shall use the driving system and installation methods described in the approved driving system submittal for a given control location. Any change in hammers from those submitted and approved by the Engineer shall also meet the requirements for driving system submittals. Revised and new driving system submittals shall be approved by the Engineer prior to using corresponding driving systems on production permanent steel casing . The Contractor shall allow the Engineer 15 working days to review each revised and each new driving system submittal after a complete set, as determined by the Engineer, has been received.

Approval of permanent steel casing driving equipment will not relieve the Contractor of his responsibility to drive permanent steel casing , free of damage, to the specified penetration.

CALIFORNIA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION LABORATORY

PILE AND DRIVING DATA FORM

Structure Name : _____ Contract No.: _____
 _____ Project: _____
 Structure No.: _____ Pile Driving Contractor or Subcontractor _____
 Dist./Co./Rte./kilo.post: _____

(Pile Driven By)

	Hammer	Manufacturer: _____ Model: _____ Type: _____ Serial No.: _____ Rated Energy: _____ at _____ Length of Stroke _____ Modifications: _____ _____ _____ _____
	Capblock (Hammer Cushion)	Material: _____ Thickness: _____ mm Area: _____ mm ² Modulus of Elasticity - E: _____ MPa Coefficient of Restitution - e: _____
	Pile Cap	<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px; margin-right: 10px;"> Helmet Bonnet Anvil Block Drivehead </div> <div>Mass: _____ kg</div> </div>
	Pile	Material: _____ Thickness: _____ mm Area: _____ mm ² Modulus of Elasticity - E: _____ MPa Coefficient of Restitution - e: _____
	Pile	Pile Type: _____ Length (In Leads): _____ m kg/m.: _____ Taper: _____ Wall Thickness: _____ mm Cross Sectional Area: _____ mm ² Design Pile Capacity: _____ kN Description of Splice: _____ _____ Tip Treatment Description: _____

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Foundation Testing &
Instrumentation
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Structures Foundations
- ☐ Resident Engineer

Note: If mandrel is used to drive the pile, attach separate manufacturer's detail sheet(s) including mass (kg) and dimensions.

Submitted By: _____ Date: _____

Phone No.: _____

CAST-IN-DRILLED-HOLE CONCRETE PILES

Cast-in-drilled-hole concrete piling shall conform to the provisions in Section 49-4, "Cast-In-Place Concrete Piles," of the Standard Specifications and these special provisions.

Attention is directed to "Hazardous Material Excavation" elsewhere in these special provisions.

Cast-in-drilled-hole concrete piling (rock socket) shall consist of drilling or coring bedrock sockets to the depths or lengths specified and filling with reinforced concrete in conformance with the details shown on the plans and these special provisions. Cored holes shall conform to the provisions of Section 49-4.03, "Drilled Holes," of the Standard Specifications and these special provisions.

Permanent steel casings are required at the locations shown on the plans. If directed by the Engineer the Contractor shall extend the cast-in-drilled-hole concrete piling, including bar reinforcing steel and permanent steel casing. If directed by the Engineer, the Contractor shall also extend the specified tip elevation of the cast-in-drilled-hole concrete piling (rock socket) and extend the inspection pipes to 100 mm clear of the bottom of the drilled or cored hole.

The first and second paragraphs of Section 49-4.01, "Description," of the Standard Specifications are amended to read:

- Cast-in-place concrete piles shall consist of one of the following:
 - A. Steel shells driven permanently to the required bearing value and penetration and filled with concrete.
 - B. Steel casings installed permanently to the required penetration and filled with concrete.
 - C. Drilled holes filled with concrete.
 - D. Rock sockets filled with concrete.
- The drilling of holes shall conform to the provisions in these specifications. Concrete filling for cast-in-place concrete piles is designated by compressive strength and shall have a minimum 28-day compressive strength of 25 MPa. At the option of the Contractor, the combined aggregate grading for the concrete shall be either the 25-mm maximum grading, the 12.5-mm maximum grading, or the 9.5-mm maximum grading. Concrete shall conform to the provisions in Section 90, "Portland Cement Concrete," and Section 51, "Concrete Structures." Reinforcement shall conform to the provisions in Section 52, "Reinforcement."

The fourth paragraph of Section 49-4.03, "Drilled Holes," of the Standard Specifications is amended to read:

- After placing reinforcement and prior to placing concrete in the drilled hole, if caving occurs or deteriorated foundation material accumulates on the bottom of the hole, the bottom of the drilled hole shall be cleaned. The Contractor shall verify that the bottom of the drilled hole is clean.

The provisions of "Welding Quality Control" of these special provisions shall not apply to temporary steel casings.

Cast-in-drilled-hole (CIDH) concrete piles shall be excavated and constructed under slurry unless otherwise approved in writing by the Engineer. Additional methods, including but not limited to temporary casings and placement of slurry cement or concrete may be necessary to control caving at some locations. At 2.5 meter CIDH concrete piles, where a construction joint is used inside the permanent steel casings and the remainder of the pile can be dewatered, the portion of the pile above the construction joint may be placed without slurry.

Materials

Concrete deposited under slurry shall have a nominal penetration equal to or greater than 90 mm. Concrete shall be proportioned to prevent excessive bleed water and segregation.

Concrete deposited under slurry shall contain not less than 400 kg of cement per cubic meter.

For cast-in-drilled-hole concrete piling, the following gradation is added to the table in the third paragraph in Section 90-3.01, "General," of the Standard Specifications:

Primary Aggregate Nominal Size	Sieve Sizes	Limits of Proposed Gradation
12.5 mm x 4.75 mm	9.5 mm	40 - 78
9.5 mm x 2.36 mm	9.5 mm	50 - 85

The Contractor shall use either the 12.5-mm maximum combined aggregate grading or the 9.5-mm maximum combined aggregate grading. For cast-in-drilled-hole concrete piling, the following table is added to the first paragraph in Section 90-3.02, "Coarse Aggregate Grading," of the Standard Specifications:

Sieve Sizes	Percentage Passing Primary Aggregate Nominal Sizes			
	12.5 mm x 4.75 mm		9.5 mm x 2.36 mm	
	Operating Range	Contract Compliance	Operating Range	Contract Compliance
19 mm	100	100		
12.5 mm	82 - 100	80 - 100	100	
9.5 mm	X ± 15	X ± 22	X ± 15	X ± 20
4.75 mm	0 - 15	0 - 18	0 - 25	0 - 28
2.36 mm	0 - 6	0 - 7	0 - 6	0 - 7

For cast-in-drilled-hole concrete piling, the following grading limits of combined aggregates for the 12.5-mm x 4.75-mm primary aggregate nominal size or for the 9.5-mm x 2.36-mm primary aggregate nominal are added to the table in Section 90-3.04, "Combined Aggregate Gradings," of the Standard Specifications:

Grading Limits of Combined Aggregate		
Sieve Sizes	Percentage Passing	
	12.5-mm Max.	9.5-mm Max.
19 mm	100	100
12.5 mm	90 - 100	100
9.5 mm	55 - 86	50 - 100
4.75 mm	45 - 63	45 - 63
2.36 mm	35 - 49	35 - 49
1.18 mm	25 - 37	25 - 37
600 µm	15 - 25	15 - 25
300 µm	5 - 15	5 - 15
150 µm	1 - 8	1 - 8
75 µm	0 - 4	0 - 4

Seismic sensor steel pipes shall be furnished and installed in the cast-in-drilled-hole concrete piles as shown on the plans. The pipes shall be Schedule 40, 4-inch diameter galvanized steel pipe of commercial quality conforming to the requirements of Section 20-2.15A, "Steel Pipe," of the Standard Specifications. The Contractor shall notify the Engineer at least 2 weeks prior to installation of the seismic sensor steel pipes, within the piles and permanent steel casings. Specially formed sealed caps (Bishops Hats) will be installed at the bottom of the seismic sensor steel pipes, with instrumentation cables extending up through the casing. Bishops Hats and instrumentation cables will be furnished by the State and will be installed by personnel of the California Division of Mines and Geology (CDMG). The Contractor shall assist CDMG personnel with transferring Bishops Hat orientation marks to the tops of the seismic sensor steel pipes after said pipes are assembled and joints are secured. The seismic sensor steel pipes shall be installed in straight alignment and shall be plumb within ±1 degree. The seismic sensor steel pipes shall be securely fastened in place to prevent misalignment during installation of the reinforcement and placing concrete.

SLURRY

Slurry shall be commercial quality synthetic drilling slurry and shall conform to the requirements of these special provisions.

Slurry shall be premixed prior to placement in the cast-in-drilled-hole concrete piling. In hole mixing or slurry within the casing prior to excavation of the rock socket will be permitted provided that excavation within the casing is not closer than 3 meters to the casing tip.

Water for slurry may be either fresh water (potable), natural ground water or saltwater. If freshwater is used, the Contractor shall determine the chlorine content prior to use. All water for mixing slurry shall be mixed with salt. The salt content of the water used in slurries shall be 6 percent minimum. The slurry mixing sequence shall conform to the requirements of these special provisions, and the recommendations of the slurry manufacturer.. Freshwater will not be allowed to be added directly into the holes after rock socket excavation has been started. Slurry shall not weaken the bond between the concrete and both the reinforcement and the foundation material at the sides of the excavation.

The Contractor shall sample and test all slurry in the presence of the Engineer, unless otherwise directed. The date, time, names of the persons sampling and testing the slurry, and results of the tests shall be recorded and shall be approved by the Engineer before concrete is placed. A copy of slurry test results shall be delivered to the Engineer at the completion of each pile.

Synthetic

Synthetic slurries shall be used in conformance with the manufacturer's recommendations and these special provisions. The following synthetic slurries may be used:

PRODUCT	MANUFACTURER
SlurryPro CDP	KB Technologies Ltd. Suite 216 735 Broad Street Chattanooga, TN 37402 (800) 525-5237
Super Mud	PDS Company c/o Champion Equipment Company 8140 East Rosecrans Ave. Paramount, CA 90723 (562) 634-8180
Shore Pac GCV	CETCO Drilling Products Group 1350 West Shure Drive Arlington Heights, IL 60004 (847) 392-5800

Inclusion of a synthetic slurry on the above list may be obtained by meeting the Department's requirements for synthetic slurries. The requirements can be obtained from the Office of Structure Design, P.O. Box 942874, Sacramento, CA 94274-0001.

Synthetic slurries listed may not be appropriate for a given site.

Synthetic slurries shall not be used in holes drilled in primarily soft or very soft cohesive soils as determined by the Engineer.

A manufacturer's representative, as approved by the Engineer, shall provide technical assistance for the use of their product, shall be at the site prior to introduction of the synthetic slurry into a drilled hole, and shall remain at the site until released by the Engineer.

SlurryPro CDP synthetic slurries shall be mixed in conformance with the following sequence:

1. Bring water to the required range of pH by using the SlurryPro product, ProTek.
2. Mix the water with SlurryPro CDP synthetic slurry.
3. Add the SlurryPro product, MPA. MPA shall be diluted to a 10 percent solution prior to adding to the water and slurry mixture.
4. Add salt to obtain the required salt content. Salt may be mixed with the water prior to adding ProTek and MPA.
5. Adjust pH by using ProTek.

Super Mud synthetic slurries shall be mixed in conformance with the following sequence:

1. Using river water or water with added salt, adjust the pH to the specified range of 8-10 by using soda ash (Na_2CO_3) at a rate of 0.6kg-1.2kg/1000 liters.
2. Add Super Mud liquid to the water at a rate of 1:300 or until the specified viscosity is achieved.
3. Add salt as the Super Mud is added to the specified levels if needed.
4. Adjust pH with soda ash, the viscosity with additional Super Mud liquid and the salt content with additional salt as the slurry is circulated during the drilling operation.
5. The pH, viscosity, density and salt content should be monitored continuously as the slurry is used. The frequency of testing the slurry should be determined by the manufacturer's on-site representative and as approved by the Engineer.

Shore Pac GCV slurries shall be mixed in conformance with the following sequence:

1. Using either freshwater or seawater as mix water, bring it to the recommended pH range of 8-10 by the addition of soda ash (Na_2CO_3).
2. Salt may be added at this point to achieve the required salt content, if salt is added, recheck and rebalance the pH with more soda ash, if necessary.

3. Mix Shore Pac into the mix water to reach the desired viscosity as recommended by the manufacturer.
4. Salt may be added for the first time at this point or it may be added to as necessary to adjust the required salt content.
5. Monitor and adjust pH on a regular basis.

Synthetic slurries shall be sampled and tested at both mid-height and near the bottom of the rock socket. Samples shall be taken and tested during drilling as necessary to verify the control of the properties of the slurry. Samples shall be taken and tested when drilling is complete, but prior to final cleaning of the bottom of the hole. When samples are in conformance with the requirements shown in the following tables for each slurry product, the bottom of the hole shall be cleaned and any loose or settled material removed. Samples shall be obtained and tested after final cleaning with steel reinforcement in place and just prior to placing concrete.

SlurryPro CDP synthetic slurries shall be tested for conformance to the requirements shown in the following table:

SLURRYPRO CDP KB Technologies Ltd.		
PROPERTY	REQUIREMENT	TEST
Density (kg/m ³)		Mud Weight (Density) API 13B-1 Section 1
- during drilling	less than or equal to 1075*	
- prior to final cleaning	less than or equal to 1025*	
- just prior to placing concrete		
Viscosity (seconds/liter)		Marsh Funnel and Cup API 13B-1 Section 2.2
- during drilling	53 to 127	
-prior to final cleaning	less than or equal to 74	
- just prior to placing concrete		
pH	6 to 11.5	Glass Electrode pH Meter or pH Paper
Sand Content (percent)		Sand API 13B-1 Section 5
- prior to final cleaning	less than or equal to 0.5	
- just prior to placing concrete		
* Salt content shall be a minimum of 6 percent by weight and the allowable densities shall be increased by a minimum of 65 kg/m ³ . Slurry temperature shall be at least 4 degrees Celsius when tested.		

Super Mud synthetic slurries shall be tested for conformance to the requirements shown in the following table:

SUPER MUD PDS Company		
PROPERTY	REQUIREMENT	TEST
Density (kg/m ³) - prior to final cleaning - just prior to placing concrete	less than or equal to 1025*	Mud Weight (Density) API 13B-1 Section 1
Viscosity (seconds/liter) - during drilling - prior to final cleaning - just prior to placing concrete	34 to 64 less than or equal to 64	Marsh Funnel and Cup API 13B-1 Section 2.2
pH	8 to 10.0	Glass Electrode pH Meter or pH Paper
Sand Content (percent) - prior to final cleaning -just prior to placing concrete	less than or equal to 0.5	Sand API 13B-1 Section 5
* Salt content shall be a minimum of 6 percent by weight and the allowable densities shall be increased by a minimum of 65 kg/m ³ . Slurry temperature shall be at least 4 degrees Celsius when tested.		

Shore Pac GCV synthetic slurries shall be tested for conformance to the requirements shown in the following table:

Shore Pac GCV CETCO Drilling Products Group		
PROPERTY	REQUIREMENT	TEST
Density (kg/m ³) - prior to final cleaning - just prior to placing concrete	less than or equal to 1025*	Mud Weight (Density) API 13B-1 Section 1
Viscosity (seconds/liter) - during drilling - prior to final cleaning - just prior to placing concrete	35 to 78 less than or equal to 60	Marsh Funnel and Cup API 13B-1 Section 2.2
pH	8.0 to 11.0	Glass Electrode pH Meter or pH Paper
Sand Content (percent) - prior to final cleaning - just prior to placing concrete	less than or equal to 0.5	Sand API 13B-1 Section 5
* Salt content shall be a minimum of 6 percent by weight and the allowable densities shall be increased by a minimum of 65 kg/m ³ . Slurry temperature shall be at least 4 degrees Celsius when tested.		

The viscosity of slurry shall be maintained during drilling, and during final cleaning. Additional synthetic product and additives shall be added to the slurry in the cast-in-drilled-hole concrete pile, as necessary, to maintain minimum required viscosity. In addition, any fresh slurry to be added to the existing slurry in the cast-in-drilled-hole concrete pile shall have a salt content of 6 percent minimum.

Slurry viscosity and salt content shall be regularly monitored and as determined necessary by the Engineer. Dissolved salt probes may be used to determine salt content. The accuracy of dissolved salt probes shall be tested by the Contractor to ensure that slurry mixed with drill cuttings will not give erroneous results. Testing shall be use a slurry temperature equal to the water temperature in the Carquinez Straits at the project site and shall include soils taken from the lower portions of the casing excavation. Testing shall be completed and approved by the Engineer prior to using any slurry in the piles.

Water

Water shall not be used as slurry .

Construction

The Contractor may not drill adjacent cast-in-drilled-hole concrete piling simultaneously and concrete shall have been placed to a level at least 1.0 meter into the permanent steel casing or to the cutoff elevation for piles without permanent steel casing and allowed to cure for a minimum of 2 days before beginning drilling or permanent or temporary casing installation on any piling immediately adjacent to another piling.

For all CIDH concrete piles constructed under slurry, once drilling or excavation of the CIDH has begun it shall continue 24 hours a day until the shaft is completed to the specified tip elevation and concrete has been placed at least up to the level of the optional construction joint near the bottom of the permanent steel casing. Cleaning of the casing, sonic logging of the casing and shaft and placement of the reinforcing cage shall begin immediately after completion of the drilling to the

specified tip elevation. Concrete placement shall begin immediately after the reinforcing cage is inserted into the hole and the bottom has been re-cleaned.

For all CIDH concrete piles constructed under slurry, spare grouting repair tubes (additional to gamma testing tubes) shall be provided as shown on the drawings, as specified in these special provisions and as directed by the Engineer.

The optional construction joint shown on the plans for the 2.5 m CIDH concrete pile, as well as the joint near the bottom of footing elevation (where the transition to footing concrete is made) shall be prepared in accordance with the requirements of Section 51-1.13, "Bonding" of the Standard Specifications and these special provisions.

The Contractor shall submit a placing plan to the Engineer for approval prior to producing the test batch for cast-in-drilled-hole concrete piling and at least 10 working days prior to constructing piling. The plan shall include complete description, details, and supporting calculations as listed below:

A. Requirements for all cast-in-drilled hole concrete piling:

1. Concrete mix design, certified test data, and trial batch reports.
2. Drilling and/or coring methods and equipment.
3. Proposed method for casing installation, cleaning and removal when necessary.
4. Plan view drawing of pile showing reinforcement and inspection pipes, if required.
5. Methods for placing, positioning, and supporting bar reinforcement, seismic sensor steel pipes, gamma testing tubes, grout repair tubes, including spacing and layout of rollers and spacers.
6. Methods and equipment for accurately determining the depth of concrete and actual and theoretical volume placed, including effects on volume of concrete when any casings are withdrawn.
7. Methods and equipment for verifying that the bottom of the drilled hole is clean prior to placing concrete.

B. Additional requirements when concrete is placed under slurry:

1. Concrete batching, delivery, and placing systems including time schedules and capacities therefor. Time schedules shall include the time required for each concrete placing operation at each pile.
2. Concrete placing rate calculations. Calculations shall be based on the initial pump pressures or static head on the concrete and losses throughout the placing system, including anticipated head of slurry and concrete to be displaced.
3. Suppliers test reports on the physical and chemical properties of the slurry and any proposed slurry chemical additives including Material Safety Data Sheet.
4. Slurry testing equipment and procedures.
5. Removal and disposal of excavation, slurry, and contaminated concrete, including methods and rates of removal.
6. Slurry agitating, recirculating, and cleaning methods and equipment.
7. Procedure for cleaning the construction joint, if used, at the base of the permanent steel casing, including a description of the methods and tools that will be used to access the whole area of the joint.
8. Procedure for cleaning the bottom of the hole after insertion of the reinforcing cage.

The Contractor shall continuously log information concerning drilling of all CIDH concrete piles in a "Drilling Log." The drilling log shall be available to the Engineer at any time during drilling and the completed log shall be submitted to the Engineer at the completion of drilling for each pile. The drilling log shall include penetration rate, cutting descriptions, estimated volumes of cuttings as compared to theoretical, and other information pertaining to the drilling process such as loss of circulation, zones of caving, down pressure methods and equipment used to prevent caving.

In addition to compressive strength requirements, the consistency of the concrete to be deposited under slurry shall be verified before use by producing a batch to be tested. The test batch shall be produced and delivered to the project under conditions and in time periods similar to those expected during the placement of concrete in the piles. Concrete for the test batch shall be placed in an excavated hole or suitable container of adequate size to allow testing in conformance with California Test 533. Depositing of test batch concrete under slurry will not be required. The test batch shall demonstrate that the proposed concrete mix design achieves both the specified nominal penetration and a penetration of at least 50 mm after twice the time required for each concrete placing operation at each pile, as submitted in the placing plan, has elapsed. The time period shall begin at the start of placement. The concrete shall not be vibrated or agitated during the test period. Upon completion of testing, the concrete shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Concrete deposited under slurry shall not be vibrated until all temporary casing is removed and concrete contaminated with soil, slurry, or other materials is removed. Concrete deposited under slurry shall be vibrated in the upper 8 m of the pile. If the Contractor elects to use the optional construction joint and place the upper portions of the pile in the dry, the concrete

shall also be vibrated in the upper 8m of the pile except that vibration may be done as the concrete is brought up within the casing.

The concrete deposited under slurry shall be carefully placed in a compact, monolithic mass and by a method that will prevent washing of the concrete. Placing concrete shall be a continuous operation lasting not more than the time required for each concrete placing operation at each pile, as submitted in the placing plan, unless otherwise approved in writing by the Engineer. The concrete shall be placed with concrete pumps and delivery tube system of adequate number and size to complete the placing of concrete in the time specified. The delivery tube system shall consist of the following:

A tremie tube or tubes, each of which are at least 250 mm in diameter, fed by one or more concrete pumps. The tremie tubes shall be gravity fed. If pumps are used to deliver the concrete, a hopper shall be used to feed the tremie tubes. Tremie tubes linked directly to the pump discharge tubes are not allowed.

The delivery tube system shall consist of watertight tubes with sufficient rigidity to keep the ends always in the mass of concrete placed. If only one delivery tube is utilized to place the concrete, the tube shall be placed near the center of the drilled hole. Multiple tubes shall be uniformly spaced in the hole. Internal bracing for the steel reinforcing cage shall accommodate the delivery tube system.

Spillage of concrete into the slurry during concrete placing operations shall not be allowed. Delivery tubes shall be capped with a water tight cap, or plugged above the slurry level with a good quality, tight fitting, moving plug that will expel the slurry from the tube as the tube is charged with concrete. The cap or plug shall be designed to be released as the tube is charged. The pump discharge or tremie tube shall extend to the bottom of the hole before charging the tube with concrete. After charging the delivery tube system with concrete, the flow of concrete through a tube shall be induced by slightly raising the discharge end. During concrete placement, the tip of the delivery tube shall be maintained to prevent reentry of the slurry into the tube. Until at least 3 m of concrete has been placed, the tip of the delivery tube shall be within 150 mm of the bottom of the drilled hole, and then the embedment of the tip shall be maintained at least 3 m below the top surface of the concrete. Rapid raising or lowering of the delivery tube shall not be permitted. If the seal is lost or the delivery tube becomes plugged and must be removed, the tube shall be withdrawn, the tube cleaned, the tip of the tube capped to prevent entrance of the slurry, and the operation restarted by pushing the capped tube 3 m into the concrete and then reinitiating the flow of concrete.

The slurry level shall be maintained within 300 mm of the top of the permanent or temporary steel casing .

When concrete is delivered by pumping, a fully operational standby concrete pump available to be on site and in position, adequate to complete the work in the time specified, shall be provided at the site during concrete placement.

A log of the placing of the concrete in each drilled hole shall be maintained by the Contractor when concrete is deposited under slurry. The log shall show the pile location, tip elevation, dates of excavation and concrete placement, total quantity of concrete deposited, length and tip elevation of any casing, and details of any hole stabilization method and materials used. The log shall include a 215 mm x 280 mm sized graph of the concrete placed versus depth of hole filled. The graph shall be plotted continuously throughout placing of concrete. The depth of drilled hole filled shall be plotted vertically with the pile tip oriented at the bottom and the quantity of concrete shall be plotted horizontally. Readings shall be made at least at each 1.5 m of pile depth, and the time of the reading shall be indicated. The graph shall be labeled with the pile location, tip elevation, cutoff elevation, and the dates of excavation and concrete placement. The log shall be delivered to the Engineer within one working day of completion of placing concrete in the pile.

After placing reinforcement and prior to placing concrete in the drilled hole, the bottom of the drilled hole shall be cleaned by air lifting. The Contractor shall demonstrate to the Engineer that the bottom of the drilled hole is clean. Methods of demonstrating that the bottom of the hole is clean shall be subject to the approval of the Engineer. Satisfactory methods of demonstrating that the hole bottom is clean might include the use of a cleanup bucket and underwater television cameras. A second cleaning of the bottom of the hole shall be done by an air lift method after insertion of the reinforcing cage. The concrete tremie pipe may be used as the conductor for the air lift.

If temporary casing is used, concrete placed under slurry shall be maintained at a level at least 1.5 m above the bottom of the casing. The withdrawal of casings shall not cause contamination of the concrete with slurry.

Material resulting from using slurry, including all material excavated from piles when slurry is used, shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications, in accordance with the permits obtained by the State, and in accordance with these special provisions.

Drill cuttings(sediments) from above the rockline and within the permanent steel casings, which are not contaminated with slurry, may be disposed of aquatically at the Carquinez Strait Dredge Material Disposal Site(SF-9) in San Pablo Bay, in accordance with the requirements of the Dredged Material Management Office and "Dredging" of these special provisions and as directed by the Engineer. If sediment excavated from piles is contaminated with slurry, aquatic disposal at the disposal site will be contingent on adequately separating the slurry from the sediment, chemically degrading the slurry and on obtaining the required disposal permits from the San Francisco Bay Area Water Quality Control Board and all other applicable permits. No delays will be allowed for the Contractor's failure to obtain the required permits for disposing of treated sediment. Drill cuttings excavated from below the rockline shall not be disposed of aquatically.

The Contractor's attention is directed to the existence of soils at Abutment 1, Piers 2, 3 and 5 and elsewhere that may require special treatment and handling, and to the requirements for disposal of this material included in these special provisions.

Permanent steel casings shall be furnished and placed tight in the hole where shown on the plans. The provisions of Section 49-1.08, "Bearing Value and Penetration," of the Standard Specifications shall not apply to permanent steel casing. Permanent casing shall be watertight and of sufficient strength to withstand the loads from installation, lateral concrete pressures, and earth pressures, and shall conform to the provisions of "Steel Pipe Piling" of these special provisions.

Sonic Logging

Just prior to inserting the reinforcing cage into the drilled hole where slurry is utilized, the Contractor shall log the hole diameter and plumbness for its full length (including the full length of the casing) using an ultrasonic logging instrument, such as a Koden Drilling Monitor Model DM 682-684, in accordance with the instrument manufacturer's recommendations and these special provisions.

The sonic logging instrument shall have the following standard features:

1. It shall be capable of determining the state of the drilled hole wall face, the hole diameter, and the deflection and inclination of the hole.
2. It shall provide hardcopy recordings of the measurements made with marks on the recordings to be able to conveniently read the results.
3. It shall be attached to a winch, cable and wire drum such that the cable is fed stably and the sensor unit will not rotate in the hole.
4. The unit shall have signal processing circuits to distinguish wall face from floating objects.
5. It shall be equipped with a break, a high voltage protection circuit and an stylus auto stop recording function.
6. A digital depth indicator shall continuously show the depth of the submersible sensor unit.
7. It shall record the wall face in 4 directions simultaneously.

Sonic logging results shall be used to determine whether hole diameter and plumbness are in accordance with the requirements of these special provisions. Sonic logging of the CIDH hole shall be performed in the presence of the Engineer. Every 2.5 m, 2.2 and 2.6 m CIDH concrete pile to be cast using slurry shall be sonically logged and hard copy printouts shall be provided to the Engineer for review. No reinforcing shall be placed into the hole or casing until the Engineer has approved of the sonic log for that hole. Holes or portions of holes which indicate diameters greater than 1.5 times the pile diameter or holes that deviate from plumb by more than 25 mm in 3 m of length shall be rejected and shall be backfilled with tremmie placed slurry cement backfill or concrete and redrilled in accordance with Section 49-4.03, "Drilled Holes," of the standard specifications. Plumbness within the casing shall be measured with respect to the vertical axis centered at the top of the casing. To account for possible irregularity within the rock socket, plumbness will be measured by fitting a theoretical cylinder the same diameter as that required for the rock socket, to the traces provided by the sonic logging, and comparing the longitudinal centerline axis of the cylinder to the vertical axis.

Acceptance Testing and Mitigation

Vertical inspection pipes shall be provided in all cast-in-drilled-hole concrete piles, except when the holes are dry or when the holes are dewatered without the use of temporary casing to control the groundwater. If the Contractor elects to use the optional construction joint in the 2.5 m CIDH concrete piling shown on the plans, and the permanent steel casing can be subsequently dewatered, then the acceptance testing using the gamma tubes will not be required within the cased zone of the pile above the construction joint.

Inspection pipes shall be Schedule 40 polyvinyl chloride pipe with a nominal inside diameter of 50 mm. Each inspection pipe shall be capped top and bottom and shall have watertight couplers to provide a clean, dry and unobstructed 50-mm diameter clear opening from 1.0 m above the pile cutoff down to the bottom of the reinforcing cage.

Inspection pipes shall be placed around the pile, inside the outermost spiral or hoop reinforcement, and 75 mm clear of the vertical reinforcement, at a uniform spacing not exceeding 840 mm measured along the circle passing through the centers of inspection pipes or as shown on the plans. The inspection pipes shall be placed to provide the maximum diameter circle that passes through the centers of the inspection pipes while maintaining the clear spacing required herein. The pipes shall be installed in straight alignment, parallel to the main reinforcement, and securely fastened in place to prevent misalignment during installation of the reinforcement and placing of concrete in the hole. Additional hoops and cross ties shall be provided as necessary to secure the tubes where they are not tied directly to the bar reinforcing steel.

The Contractor shall log the location of the inspection pipe couplers with respect to the plane of pile cut off, and these logs shall be delivered to the Engineer upon completion of the placement of concrete in the drilled hole.

After placing concrete and before requesting acceptance tests, each inspection pipe shall be tested by the Contractor in the presence of the Engineer by passing a 48.3-mm diameter rigid cylinder 610 mm long through the complete length of pipe.

If the 48.3-mm diameter rigid cylinder fails to pass any of the inspection pipes, the Contractor shall attempt to pass a 32.0-mm diameter rigid cylinder 1.375 m long through the complete length of those pipes in the presence of the Engineer. If an inspection pipe fails to pass the 32.0-mm diameter cylinder, the Contractor shall immediately fill all inspection pipes in the pile with water.

The Contractor shall replace each inspection pipe that does not pass the 32.0-mm diameter cylinder with a 50.8-mm diameter hole cored through the concrete for the entire length of the pile. Cored holes shall be located as close as possible to the inspection pipes they are replacing, no more than 150 mm inside the reinforcement and as approved by the Engineer, and coring shall not damage the pile reinforcement. Cored holes shall be made with a double wall core barrel system utilizing a split tube type inner barrel. Coring with a solid type inner barrel will not be allowed. Coring methods and equipment shall provide intact cores for the entire length of the pile concrete. The coring operation shall be logged by an Engineering Geologist or Civil Engineer licensed in the State of California and experienced in core logging. Coring logs shall include complete descriptions of inclusions and voids encountered during coring, and shall be delivered to the Engineer upon completion. Concrete cores shall be preserved, identified with the exact location the core was recovered from within the pile, and made available for inspection by the Engineer.

At all locations where inspection pipes are required, the Contractor shall construct working platforms at least 1.5 m above the high tide line and at least 1m wide on all sides of the pile. Integrity testing shall be performed from the platforms. The platforms shall be rigidly attached to the piles to prevent any movement. The platforms shall be designed for a minimum uniform load of 700 kPa. In addition, the Contractor shall provide transportation to and from all piers located within the Carquinez Straits for State personnel and all equipment required for pile integrity testing.

During acceptance testing of piling by State personnel, the Contractor shall not perform any work within 7 meters of the pile being tested.

Acceptance tests of the concrete will be made by the Engineer, without cost to the Contractor. Acceptance tests will evaluate the homogeneity of the placed concrete. Tests will include gamma-gamma logging. Tests may also include crosshole sonic logging and other means of inspection selected by the Engineer. The Contractor shall not conduct operations within 8.0 m of the gamma-gamma logging operations. The Contractor shall separate reinforcing steel as necessary to allow the Engineer access to the inspection pipes to perform gamma-gamma logging or other acceptance testing. After requesting acceptance tests and providing access to the piling, the Contractor shall allow 15 working days for the Engineer to conduct these tests if the 48.3-mm diameter cylinder passed all inspection pipes, and 20 working days if only the 32.0-mm diameter cylinder passed all inspection pipes. Should the Engineer fail to complete these tests within the time allowance, and if in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in inspection, the delay will be considered a right of way delay as specified in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

All inspection pipes and cored holes in a pile shall be dewatered and filled with grout after notification by the Engineer that the pile is acceptable. Placement and removal of water in the inspection pipes shall be at the Contractors expense. Grout shall conform to the provisions in Section 50-1.09, "Bonding and Grouting," of the Standard Specifications. The inspection pipes and holes shall be filled using grout tubes that extend to the bottom of the pipe or hole or into the grout already placed.

If acceptance testing performed by the Engineer determines that a pile does not meet the requirements of the specifications, then that pile will be rejected and all depositing of concrete under slurry or concrete placed using temporary casing for the purpose of controlling groundwater shall be suspended until written changes to the methods of pile construction are approved in writing by the Engineer.

The Contractor shall submit to the Engineer for approval a mitigation plan for repair, supplementation, or replacement for each rejected cast-in-drilled-hole concrete pile, and this plan shall conform to the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. Prior to submitting this mitigation plan, the Engineer will hold a repair feasibility meeting with the Contractor to discuss the feasibility of repairing rejected piling. The Engineer will consider the size of the defect, the location of the defect, and the design information and corrosion protection considerations for the pile. This information will be made available to the Contractor, if appropriate, for the development of the mitigation plan. If the Engineer determines that it is not feasible to repair the rejected pile, the Contractor shall not include repair as a means of mitigation and shall proceed with the submittal of a mitigation plan for replacement or supplementation of the rejected pile.

If the Engineer determines that a pile does not require mitigation due to structural, geotechnical, or corrosion concerns, the Contractor may elect to not repair anomalies found during acceptance testing of that pile. For the unrepaired pile, the Contractor shall pay to the Department, \$400 per cubic meter for the portion of the pile affected by the anomalies. The volume, in cubic meters, of the portion of the pile affected by the anomalies, shall be calculated as the area of the cross-section of the pile affected by each anomaly, in square meters, as determined by the Engineer, multiplied by the distance, in meters, from the top of each anomaly to the specified tip of the pile. If the volume calculated for one anomaly overlaps the volume calculated for additional anomalies within the pile, the calculated volume for the overlap shall only be counted once. In no case shall the amount of the payment for such piles be less than \$400. The Department will deduct the amount from any moneys due, or that may become due the Contractor under the contract.

Pile mitigation plans shall include the following:

- A. The designation and location of the pile addressed by the mitigation plan.
- B. A review of the structural, geotechnical, and corrosion design requirements of the rejected pile.
- C. A step by step description of the mitigation work to be performed, including drawings if necessary.
- D. An assessment of how the proposed mitigation work will address the structural, geotechnical, and corrosion design requirements of the rejected pile.
- E. Methods for preservation or restoration of existing earthen materials.
- F. A list of affected facilities, if any, with methods and equipment for protection of these facilities during mitigation.
- G. The State assigned contract number, bridge number, full name of the structure as shown on the contract plans, District-County-Route-Kilometer Post, and the Contractor's (and Subcontractor's if applicable) name on each sheet.
- H. A list of materials, with quantity estimates, and personnel, with qualifications, to be used to perform the mitigation work.
- I. The seal and signature of an engineer who is licensed as a Civil Engineer by the State of California.

For rejected piles to be repaired, the Contractor shall submit a pile mitigation plan that contains the following additional information:

- A. An assessment of the nature and size of the anomalies in the rejected pile.
- B. Provisions for access for additional pile testing if required by the Engineer.

For rejected piles to be replaced or supplemented, the Contractor shall submit a pile mitigation plan that contains the following additional information:

- A. The proposed location and size of additional piling.
- B. Structural details and calculations for any modification to the structure to accommodate the replacement or supplemental piling. If, in the opinion of the Engineer, the structural response of the structure is altered by the Contractor's proposed modification, the Engineer will perform necessary calculations to verify the performance of the structure as intended and as originally designed, at the Contractor's expense. The State's cost of such calculations will be deducted from the monthly progress payment.

All provisions for cast-in-drilled-hole concrete piling shall apply to replacement piling.

The Contractor shall allow the Engineer 15 working days to review the mitigation plan after a complete submittal has been received. This time shall be increased to 30 working days if modifications to the footing are proposed.

Should the Engineer fail to review the complete pile mitigation submittal within the time specified, and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in reviewing the pile mitigation plan, an extension of time commensurate with the delay in completion of the work thus caused will be granted in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

When repairs are performed, the Contractor shall submit a mitigation report to the Engineer within 10 days of completion of the repair. This report shall state exactly what repair work was performed and quantify the success of the repairs relative to the submitted mitigation plan. The mitigation report shall be stamped and signed by an engineer that is licensed as a Civil Engineer by the State of California. The mitigation report shall show the State assigned contract number, bridge number, full name of the structure as shown on the contract plans, District-County-Route-Kilometer Post, and the Contractor (and Subcontractor if applicable) name on each sheet. The Engineer will be the sole judge as to whether a mitigation proposal is acceptable, the mitigation efforts are successful, and to whether additional repairs, removal and replacement, or construction of a supplemental foundation is required.

No extensions of time or compensation will be made for the submittal and review of a mitigation plan for rejected piling.

Grout Repair Pipes

Vertical grout repair pipes, as shown on the plans, shall be provided in all cast-in-drilled hole piles cast under slurry. Grout repair pipes will not be required when the holes are dry or when the holes are dewatered without the use of temporary casing.

Grout repair pipes shall be Schedule 40 polyvinyl chloride pipe with an inside diameter of 50.8 mm. Each repair pipe shall be capped top and bottom and shall have watertight couplers to provide a clean, dry and unobstructed 50.8 mm diameter clear opening from the top of the pile down to the specified tip elevation. After approval of the pile by the Engineer, grout repair tubes shall be filled with grout following the same procedures as are used for filling of the inspection pipes above.

MEASUREMENT AND PAYMENT (PILING)

Measurement and payment for the various types and classes of piles shall conform to the provisions in Sections 49-6.01, "Measurement," and 49-6.02, "Payment," of the Standard Specifications and these special provisions.

The third paragraph of Section 49-6.02, "Payment," of the Standard Specifications is amended to read:

- The contract price paid per meter for cast-in-drilled-hole concrete piling shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in drilling holes, disposing of material resulting from drilling holes, temporarily casing holes and removing water when necessary, furnishing and placing concrete and reinforcement, and constructing reinforced concrete extensions, complete in place, to the required penetration, as shown on the plans, as specified in these specifications and in the special provisions, and as directed by the Engineer.

The sixth paragraph of Section 49-6.02 "Payment," of the Standard Specifications shall not apply.

If permanent steel casings are fabricated more than 480 airline kilometers from both Sacramento and Los Angeles, additional shop inspection expenses will be sustained by the State. Whereas it is and will be impractical and extremely difficult to ascertain and determine the actual increase in such expenses, it is agreed that payment to the Contractor for furnishing permanent steel casing will be reduced by \$10,000 for each manufacture or fabrication site located more than 480 air line kilometers from both Sacramento and Los Angeles.

Payment for cast-in-place concrete piling shall conform to the provisions in Section 49-6.02, "Payment," of the Standard Specifications except that, when the diameter of cast-in-place concrete piling is shown on the plans as 600 mm or larger, reinforcement in the piling will be paid for by the kilogram as bar reinforcing steel (bridge).

The contract lump sum price paid for load test pile shall include full compensation for furnishing all labor, materials, equipment, and incidentals and for doing all the work involved in the load test pile, including washout and grouting below the pile tip and additional load test piles should the Contractor propose a different installation methods for the production piling, as specified in the Standard Specifications and these special provisions and as directed by the Engineer.

Full compensation for cutting off test piles as specified, shall be considered as included in the contract lump sum price paid for the load test pile, and no additional compensation will be allowed.

No additional compensation or extension of time will be made for additional foundation investigation as required in "Install Seismic Monitoring Casing" of these special provisions, or for installation and testing of the load test pile(s), cutting off piling and restoring the foundation investigation and load testpile sites, and review of request by the Engineer.

Full compensation for slurry, storage of slurry, recycling of slurry, depositing concrete under slurry, test batches, inspection pipes, building test platforms above high tide, temporary and permanent steel casing, filling inspection holes and pipes with grout, drilling oversized cast-in-drilled-hole concrete piling, filling cave-ins and oversized piles with concrete, storing, barging and disposing of sediment drill cuttings at the designated disposal site, storing, and disposal of bedrock drill cuttings and re-drilling through concrete shall be considered as included in the contract prices paid per meter for cast-in-drilled-hole concrete piling of the sizes listed in the Engineer's Estimate and no additional compensation will be allowed therefor.

The contract price paid per meter for cast-in-drilled-hole concrete piling (rock socket) of the sizes listed in the Engineer's estimate shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in drilling or coring holes, disposing of the material resulting from drilling or coring holes, and furnishing and placing concrete and placing reinforcement, complete in place, to the required penetration, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract price paid per meter for permanent steel casing of the sizes listed in the Engineer's estimate shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing permanent steel casing, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Additional permanent steel casing, cast-in-drilled-hole concrete piling (rock socket) and cast-in-drilled-hole concrete piling, including inspection pipes, and bar reinforcing steel, required to extend the permanent steel casing to into bedrock and to maintain the length of cast-in-drilled-hole concrete piling (rock socket) into bedrock, as shown on the plans, will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

Full compensation for cleaning out the permanent steel casing prior to installing reinforcement and filling with concrete, for disposing of materials removed from the inside of the pile, as shown on the plans, and as specified in these special provisions, and as directed by the Engineer shall be considered as included in the contract unit price paid per meter for permanent steel casing and no additional compensation will be allowed therefor.

Full compensation for conforming to the provisions on welding and nondestructive testing of these special provisions shall be considered as included in the contract prices paid for the various items of work involved, and no additional compensation will be allowed therefor.

Full compensation for , for providing access for the Engineer on monitored permanent steel casings, , for providing additional stickup length on casing to be monitored, for providing and welding additional stickup length on additional permanent steel casings required to be monitored as directed by the Engineer, and for installing and removing the instruments from the permanent steel casings shall be considered as included in the contract unit price paid per meter for permanent steel casings and no separate payment will be made therefor. The length of permanent steel casing to be paid for shall include the lengths that monitored piles are redriven.

Full compensation for providing special tips, or for subexcavating or employing other measures to prevent damage to the permanent steel casings shall be considered as included in the contract price paid per meter for 2.5 m permanent steel casing and no additional compensation will be allowed therefor.

Full compensation for center relief drilling to install 2.5 m permanent steel casing and for disposing of material resulting from , center relief drilling, shall be considered as included in the contract unit price paid per meter for 2.5 m permanent steel casing and no additional compensation will be allowed therefor.

Full compensation for driving system submittals shall be considered as included in the contract unit price paid per meter for 2.5 m permanent steel casing and no additional compensation will be allowed therefor.

Full compensation for constructing the CIDH concrete piles 24 hours a day shall be considered as included in the unit prices paid for the various types of CIDH concrete piling shown on the plans and no additional compensation will be allowed therefor.

Full compensation for furnishing and installing grout repair piping, as shown on the plans, shall be considered as included in the contract price paid for piles of the various classes and types shown on the plans and no additional compensation will be allowed therefor.

Full compensation for sonic testing and logging of CIDH's placed under slurry to verify hole diameter and plumbness, shall be considered as included in the contract price paid for piles of the various classes and types shown on the plans and no additional compensation will be allowed therefor.

Full compensation for added length of permanent steel casing in casings to be driven and dynamically monitored shall be included in the contract price paid for 2.5 m permanent steel casing and no additional compensation will be allowed therefor.

10-1.42 VIBRATION MONITORING SYSTEM

This work shall consist of vibration monitoring and photo recording as a means of protecting the Rhodia treatment plant facility from excess vibration during the construction of the new bridge.

Vibration monitoring and recording shall be performed during the course of all cast-in-drilled-hole pile construction, pile driving and pile driving related activities near Piers 2 and 3 and in between and for other significant impact work as determined by the Engineer when such work occurs within 60 meters of the Rhodia treatment plant.

The first vibration monitoring prior to the start of construction activities shall be the baseline for all subsequent recordings. The baseline vibration monitoring shall conform to the requirements of these special provisions and shall be performed prior to the start of any work on the project. The monitoring equipment shall be operational and acquire background vibration data at each instrument location for a period of not less than 24 hours. The equipment and the quantity of monitoring devices used in the background vibration monitoring shall be the same as those used during the vibration monitoring during significant impact work specified herein. The vibration results, graphs and data shall be submitted to the Engineer immediately after completion of the monitoring. No work that has the potential to cause significant damage or significant impact work on the project will be allowed until all background monitoring results are submitted to the Engineer. Prior to beginning any construction within 60 meters of the facility, the Contractor shall create a photo record of the condition of the treatment plant. The cameras used shall have an automatic dating feature so that the date is recorded on the photograph. A copy of all photographs shall be submitted to the Engineer prior to beginning any impact work near the facility.

Prior to performing any vibration monitoring, including the background vibration monitoring and during significant impact work, the Contractor shall submit to the Engineer a written plan detailing the procedures for vibration monitoring. Such details shall include:

1. The name of the firm providing the vibration monitoring services.
2. Description of the instrumentation and equipment to be used,
3. Methods for mounting the instrumentation to the surface,
4. Procedures for data collection and analysis and the location
5. Quantity of instrumentation
6. Means and methods of providing warning when particle velocity equals or exceeds specified limits.
7. Name of the responsible person designated by the Contractor.

The details shall conform to the requirements in Section 5-1.02, "Plans and Working Drawings", of the Standard Specifications. The review period shall be the same as those set forth in Section 51-1.06A, "Falsework Design and Drawings."

Once the vibration monitoring plan is approved by the Engineer, the vibration monitoring equipment shall be furnished and installed by the Contractor at the facility designated herein when the significant impact work occurs within 60 meters said facility. The 60 meters shall be measured from the source of the vibration such as the location of the equipment or the pile location.

Vibration monitoring equipment shall be furnished and installed by the Contractor and shall be capable of continuous operation with instant monitoring results. The Contractor shall have the vibration monitoring equipment in place, operational and functioning properly prior to performing any significant impact work within 60 meters of the affected property.

The vibration monitoring equipment shall conform to the following requirements:

1. The velocity sensing transducers shall be capable of measuring velocities on three perpendicular axes (i.e., V_x , V_y and V_z) simultaneously.
2. Frequency response of the velocity transducers and data acquisition equipment shall cover the range from less than 5 Hz to more than 100 Hz. Sensitivity of the velocity transducers shall range from below 0.0254 mm per second to more than 50.8 mm per second.
3. Velocity transducers shall be field calibrated prior to use.
4. The data acquisition equipment shall be capable of simultaneously recording individual velocity transducers, in digital format, time-domain data (i.e. time vs. particle velocity) for each of the transducers at a sample rate not less than 1024 samples per second.

The equipment shall be set up in a manner such that an immediate warning is given when a peak particle velocity equal to or exceeding 5.1mm per second is produced on any of the three perpendicular axes. The equipment shall also determine resultant particle velocity which shall be derived from the component particle velocity V_x , V_y and V_z at a frequency equal to the data sampling rate and shall be equal to the square root of the sum of $(V_x)^2 + (V_y)^2 + (V_z)^2$.

Date, time, peak resultant particle velocity, peak V_x , peak V_y , and peak V_z shall be recorded during pile driving for intervals not to exceed one minute in delimited ASCII code and provided to the Engineer at the completion of work each day. A plot depicting the time history of peak resultant particle velocity and a printout documenting the time history of peak resultant particle velocity, peak V_x , peak V_y , and peak V_z shall also be provided to the Engineer at the completion of work each day.

The warning emitted by the vibration monitoring equipment shall be instantaneously transmitted to the responsible person designated by the Contractor by means of warning lights, audible sounds or electronic transmission. The responsible person designated by the Contractor shall have the authority to stop the work causing the vibration.

When any reading on monitoring equipment equals or exceeds 5.1 mm per second, work shall immediately cease and the Contractor shall immediately take whatever action is necessary to reduce and maintain the monitoring equipment reading below a particle velocity of 5.1 mm per second before resuming work. The Contractor shall immediately notify the Engineer every time the vibration is equal to or exceeds 5.1mm per second. No work shall resume until the Engineer approves of the Contractor's procedures to reduce the vibration to below 5.1mm per second.

Monitoring equipment shall be stationed within 1 meter of the exterior of designated buildings on the side facing the work with the potential to cause significant vibration. For facilities whose frontage exceeds 60 meters, at least 2 monitors shall be utilized at that location. The Contractor shall obtain written permission from property owners prior to installing monitoring equipment outside the State's right of way or limits of the temporary right of entry.

The Contractor shall provide the Engineer all the vibration monitoring results and graphs on the same day the monitoring was performed. All graphs and results shall be signed in ink by the person who performed the vibration monitoring.

Within 10 working days after the completion of the background vibration monitoring and vibration monitoring during significant impact work at the facility designated herein, the Contractor shall submit to the Engineer a report documenting the results of the vibration monitoring. The reports shall be signed by an engineer who is registered as Civil Engineer in the State of California who is experienced in and who has a recognized expertise in the field of vibration monitoring. The report shall include the following information:

1. Project identification, including District, County, Route, Post Mile, Project Name and Bridge Number as shown on the project plans.
2. Location of Monitoring equipment, including address of monitored building or facility.
3. Location of vibration source (i.e., pile driving equipment).

The persons, firms or entities providing vibration monitoring, recording, documentation and the production of the reports shall not be employed or compensated by subcontractors, or by persons or entities hired by subcontractors, who will provide other services or materials for the project.

Compliance with this section does not relieve the Contractor of full responsibility for damage caused by Contractor's operations as per Section 7-1.12 "Responsibility for Damage," of the Standard Specifications.

Payment

Full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all work involved in installing and maintaining the vibration monitoring system at the Rhodia treatment plant (PEP plant) between Piers 2 and 3, including notification and coordination with Rhodia, as specified in these special provisions and as directed by the Engineer shall be considered as included in the contract price paid for piles of the various classes and types shown on in the Engineer's Estimate and no additional compensation will be allowed therefor.

10-1.43 PRESTRESSING CONCRETE

Prestressing concrete shall conform to the provisions in Section 50, "Prestressing Concrete," of the Standard Specifications and these special provisions.

GENERAL

The tenth paragraph of Section 50-1.05, "Prestressing Steel," of the Standard Specifications is amended to read:

- Prestressing steel for post-tensioning which is installed in members prior to placing and curing of the concrete, shall be continuously protected against rust or other corrosion, until grouted, by means of a corrosion inhibitor placed in the ducts or applied to the steel in the duct. The corrosion inhibitor shall conform to the provisions in Section 50-1.05, "Prestressing Steel," of the Standard Specifications.

The third paragraph of Section 50-1.08, "Prestressing," of the Standard Specifications is amended to read:

- Working force and working stress will be considered as the force and stress remaining in the prestressing steel after all losses, including creep and shrinkage of concrete, elastic compression of concrete, creep of steel, losses in post-tensioned prestressing steel due to sequence of stressing, friction and take up of anchorages, and all other losses peculiar to the method or system of prestressing have taken place or have been provided for.

Attention is directed to "Integrated Drawings," "Health Monitoring(Shipping Channel Span)" and "Span 17 Coordination" of these special provisions.

Attention is directed to "Order of Work," of these special provisions for requirements for qualifying prestressing systems in lightweight concrete.

Attention is directed to "Cost Reduction Incentive Proposals For Cast-In-Place Prestressed Box Girder Bridges Constructed On Falsework," and to "Cost Reduction Incentive Proposals For Cast-In-Place Segmentally Constructed Bridges" of these special provisions for requirements regarding changes to the prestressing shown on the plans.

The fourth paragraph in Section 50-1.08, "Prestressing," of the Standard Specifications is amended to read:

- The loss in stress in post-tensioned prestressing steel due to creep and shrinkage of concrete, creep of steel, and sequence of stressing shall be calculated in accordance with the construction schedule shown on the plans. For vertical post-tensioning web bars, the losses shall be assumed to be 152 MPa in normal weight concrete and 228 MPa in lightweight weight concrete.

The friction and wobble coefficients for strand systems in galvanized ducts of the sixth paragraph in Section 50-1.08, "Prestressing," of the Standard Specifications, and those of Table 10-2 of the Guide Specifications for Design and Construction of Segmental Concrete Bridges shall not apply. In place friction tests in accordance with these special provisions shall be performed by the Contractor.

When intermediate grout vents are used and at the ends of grout runs, wasted grout shall be collected in containers for later disposal by the Contractor. Wasted grout shall not be allowed to collect on the deck or soffit at any time. Accidental grout spills shall be cleaned up immediately before the grout has a chance to harden.

The second through seventh paragraphs of Section 50-1.09, "Bonding and Grouting," of the Standard Specifications shall not apply. Grout and grouting of prestressing shall conform to the requirements herein.

The Contractor's prestressing subcontractor shall coordinate with the Contractor's designer of the shipping channel span instrumentation regarding the load cells to be used for monitoring the two span tendons.

Grout and Grouting

Grout for grouting of prestressing tendons and bars shall consist of a packaged grout mix and water, shall be premeasured and prepackaged by the manufacturer and shall be suitable for grouting of prestressing strand. One hour after mixing, the grout shall pass through a flow cone with continuous flow. The grout shall conform to the requirements of ASTM Designation: C 1107-91, and the following:

1. The grout shall be specially formulated to produce a fluid, extended working time, pumpable, nonshrink, nonbleeding, high strength product for grouting of prestressing tendons conforming to the following:

Property	Requirement	Test
Shrinkage	0.0%	ASTM C 827
Expansion	0.0% min.,	ASTM C 827
Bleeding	Less than 1%	Gelman or API Method
	4.0% max.	
Fluid Consistency	11-30 seconds at 5 to 38 deg C (40-100 deg F)	CORPS-CRD-611-81
1-day compressive strength	22 Mpa (3300 psi. min.)	ASTM C 109
3-day compressive strength	41 Mpa (6000 psi. min.)	ASTM C 109
28-day compressive strength	58 Mpa (8500 psi. min.)	ASTM C 109

The nonbleeding properties of the grout shall be verified in a laboratory under pressure tests such as the Gelman and API test methods for several different heights of ducts.

2. The packaged grout, prior to use, shall be stored in a cool, dry environment. The prepackaged grout shall be used within the shelf life recommended by the manufacturer. Grout shall be free from chlorides and other corrosion-causing chemicals. The following limits on contaminants in the grout shall not be exceeded:

Chlorides as CL	650ppm (by weight)
Sulfates as O ₄	650ppm (by weight)

3. Mix water shall conform to the requirements of Section 90-2.03, "Water," of the Standard Specifications. Cold water shall be used in hot weather conditions to maintain the mixed grout temperature from 7C to 32C

4. Grout shall be mixed and placed in accordance with the requirements of the manufacturer, these special provisions and as approved by the Engineer.

5. The quantity of water to be blended with the dry component, shall be within the limits recommended by the manufacturer. The quantity of water shall be the least amount required to produce a flowable or fluid batter with the required efflux time, and as approved by the Engineer.

6. Before using grout material, a minimum of 20 kilograms of grout shall be submitted to the Engineer for testing. The Contractor shall allow 45 days for the testing. Additionally, the Contractor shall submit for approval specific printed manufacturer's product data. Nonshrink properties shall not be based on gas or gypsum expansion.

7. The grout shall be mixed in mechanical mixing equipment of a type that will produce uniform and thoroughly mixed grout. Water shall be first added to the mixer followed by the prepackaged grout mixture. Retempering of grout will not be permitted. Grout shall be continuously agitated until the grout is pumped.

8. Prior to installation of strand and grouting of the tendons (bar grouting is excluded from this requirement), the Contractor shall perform an air pressure test of the ducts and take measures to eliminate or reduce leakage from the ducts. Duct plugs and air-pressure gages shall be used to satisfy this requirement.

Prior to beginning any grouting operations of prestressing tendons or bars, the Contractor shall furnish the Engineer with the results of tests, performed by a laboratory approved by the Engineer, demonstrating that the proposed grout mixture meets the requirements herein. This information shall include a graph relating compressive strength of the grout to age, covering ages from 24 hours to 28 days. The information shall include flow tests done at grout ages of immediately following mixing and at 5 minute increments of time through 30 minutes after mixing. The grout temperature shall be reported at each interval.

The Contractor shall submit to the Resident Engineer's Office, 757 Arnold Drive, Suite 200 Martinez, California 94553 at telephone number (925) 646-1996, for approval in accordance with the provisions in Section 5-1.02, "Plans and Working Drawings," written grouting procedures. Procedures shall cover, in detail: the type, quantity, shelf life and brand of materials to be used including required certifications; type of equipment needed including capacity in relation to demand and working conditions as well as provisions for backup equipment; types and locations of inlets and outlets; types and sizes of grout hoses and connections; mixing and pumping procedures; direction of grouting including sequence of use of the inlets, outlets and vents; procedures for handling blockages and for possible regrouting. For initial review, 6 sets of such plans, manuals and drawings shall be submitted. After review, between 6 and 12 sets, as requested by the Engineer, shall be submitted to the said Office for final approval and for use during construction.

Epoxy Bonding Agent

Epoxy bonding adhesive shall be a multi-component water-based epoxy resin/portland cement bonding agent suitable for use in bonding new concrete to old concrete. The epoxy bonding agent shall conform to the requirements of ASTM Designation: ASTM C881, Type II, and the following:

1. 24-hour open time.
2. VOC compliant

Epoxy Surface Sealer

Epoxy surface sealer shall be a multi-component, 100% solids by volume, corrosion resistant epoxy coating that can be applied to dry or wet surfaces. The epoxy surface sealer shall be AquataPox A-6 (Raven Lining Systems), Cibaset 2222 (Ciba Specialty Chemicals), 4221 Magma Seal (Belzona), SC-3000Y (Superior Environmental Products) or equal, as approved by the Engineer, and shall conform to the following:

1. VOC compliant.
2. Zero shrinkage.
3. Suitability for brush on or roller application.
4. Flexural strength of 55 MPa in accordance with ASTM D790.
5. 2000 hour salt spray certification, tested in accordance with ASTM B117 and evaluated in accordance with ASTM D610, D714 and D1654.
6. Adhesion of coating to concrete shall be greater than tensile strength of the concrete as tested in accordance with ASTM D4541.
7. Concrete gray coloration with UV resistance.
8. Sealer shall be applied in one coat to a minimum thickness of 380 micrometers dry film thickness as verified with wet film thickness gages meeting ASTM D4414.
- 9.

Polyethylene Duct

Where polyethylene duct is proposed for use and as allowed by the plans and specifications it shall conform to Section 4.5.2 of the Division II Construction Specifications of the AASHTO Segmental Guide Specifications except that the minimum wall thickness shall be at least 2 mm.

Blank tendon ducts cast into the superstructure, stub girder and intermediate diaphragm in Span 16 for the future bridge shall be sealed with a removable cap or plug at the west end or each duct. The Contractor shall demonstrate to the Engineer that all ducts for future tendons (both in Span 16 and elsewhere) are free from obstructions. For future transverse tendons in Span 16, a cable and rabbit shall be pushed from the open end inside the cell to the closed end to demonstrate that the duct is unobstructed. Alternately, a television probe may be inserted for the full length of each duct to demonstrate that the ducts are free and clear. Any obstructed ducts shall be repaired.

Where permanent grout caps are shown on the plans to cover anchorages, they and any connecting hardware shall be fabricated of stainless steel conforming to ASTM A-276, Type 316. At the two prestressing tendons to be instrumented with load cells (see Health Monitoring (Shipping Channel Span)), permanent stainless steel grout caps shall be used at both ends of the tendon and a corrosion inhibitor shall be blown into the ducts.

Prequalification of prestressing systems for this project, both bar and strand systems, in lightweight concrete will be required by the Contractor. There are two parts to qualifying a prestressing system for use on State projects. The first part involves work which must be submitted and approved before witnessing of the testing by the State. The second part involves physical testing of the system in the Engineer's presence. The requirements in Section 50-1.10, "Samples for Testing," of the Standard Specifications have been modified for this project as follows:

Check List for Prestressing Systems

All prestressing systems that are proposed to be used in the State of California shall be submitted in the following format to expedite approval of the system or systems.

Seven copies of the final submittal are required to be submitted and shall be bound or stapled together with a title page indicating the name or names of the systems being submitted. The Contractor shall allow 6 weeks for the review and the approval of each prestressing system checklist submittal. The individual numbered sections shall be tabbed and listed in the following order:

1. Description
 - a. Current product description literature of the system or systems being proposed.
 - b. Prior listing of the system. Include specific details of projects where it has been used.
 - c. Complete records of tests run on the system independent of Caltrans' witness tests.
 - d. Explain how seating loss is to be controlled and measured.
2. Hardware
 - a. Anchor head.
 - 1) Detailed drawing.
 - 2) Mill certificates - showing material composition, strength and manufacturer.
- 3) Quality control document.
 - b. Bearing Plate
 - 1) Detailed drawing.
 - 2) Mill certificate.
 - 3) Quality control statement.
 - c. Wedges or Nuts
 - 1) Detailed drawing.
 - 2) Mill certificate.
 - 3) Quality control document.
 - d. Trumpet detail drawings.
3. Calculations
 - a. Stress behind bearing plate at service load after losses.
 - b. Stress behind bearing plate at 95% specified ultimate tensile strength.
 - c. Maximum bending stress in bearing plate at 95% specified ultimate tensile strength.
4. System
 - a. Detailed drawings of the anchorage system, jacking system, duct and grouting details.
 - b. Complete information on grouting procedures and equipment to be used.
 - c. Description of how system components are protected from physical damage and corrosion for both shipping and storage on site.
 - d. Description of tendon repair or replacement should a failure occur.
 - e. Description of how qualified technical assistance is provided in the field for the contractor performing the work.

Post Tensioning Anchorage Systems Prequalification Testing Procedure

All items on the "Check List for Prestressing Systems" must be submitted and approved by the Transportation Laboratory before scheduling witnessing of this post tensioning anchorage systems prequalification test. The Contractor shall provide 2 weeks written notification prior to performing testing. Testing shall conform to the following:

1. Test Configuration

The test shall consist of a rectangular lightweight concrete prism accommodating two anchors meeting the requirements of AASHTO, Section II—10.3.2.3.1 to 10.3.2.3.5
2. Forms and Reinforcing

The confining reinforcing steel shall be the same as that in the local zone for that particular system. Supplementary skin reinforcement on the test block shall also assimilate conditions in the contract set for that particular tendon detail. All reinforcing bars to be ASTM A706M. Forms and reinforcing must be checked by the Engineer before placing concrete.
3. Concrete

Standard lightweight concrete mix design to be used for the structure. Testing shall be performed when test cylinders show a minimum concrete compressive strength of 25 MPa but not more than 35 MPa.
4. Concrete Placing and Curing

Place concrete following the normal procedures, vibrating well around anchorage and reinforcing steel. Take a minimum of 20 cylinders for testing. Cylinders are to be cured along side of and in the same manner as the test blocks. Three cylinders are to be taken to the Contractor's independent test lab and tested on the morning after the concrete has been placed. Three additional cylinders are to be taken each succeeding day until a concrete strength of 25MPa is reached. Tests should be conducted on that day that the strength reaches 25MPa .

5. Testing

Each anchorage system will be individually tested as follows:

- a. Check surfaces of each bearing plate and anchor head for flatness by using a straight edge and feeler gauge or a point to point spanner with a center mounted dial indicator. Record initial values.
- b. Position test block in test frame. Install anchor head, ram of sufficient size to load tendon to 95% GUTS* and the Caltrans load cell together.
- c. Install tendon strand and tension slightly to seat the wedges.
- d. Load ram to 75% GUTS and record values. Hold at 75% and examine the concrete for evidence of cracking. Record observations and map any visible crack patterns.
- e. Continue stressing to 95% of GUTS and hold for several minutes. Record values again as in paragraph "d" above. Reduce pressure to zero. Examine concrete for evidence of permanent cracking. Record observations as in paragraph "d " above.
- f. Remove anchor head from test block.
- g. Check bearing plate and anchor head for permanent deformation, with straight edge and feeler gauge or the point to point spanner with a center mounted dial indicator. Record final values.

6. Records

Test records are maintained in a Caltrans file. Post tensioners are notified of pass/fail of their system.

*Gross Ultimate Tensile Strength of tendon strand.

In addition to the requirements of Section 50-1.08, "Prestressing," of the Standard Specifications and these special provisions, prestressing jacks shall also be calibrated in accordance with the requirements of Section 5.4 of the Division II Construction Specifications of the AASHTO Guide Specifications for Design and Construction of Segmental Concrete Bridges. Documentation of this calibration shall be kept with each jack for inspection by the Engineer.

Working drawings of the prestressing shall be submitted by frame. The review time stated in the Standard Specifications shall be per frame and shall be cumulative. For example, if the Contractor submits two frames simultaneously, the review time for both frames by the Engineer shall be twice the normal review time.

The friction and wobble coefficients shown on the plans are assumed by the Engineer. The Contractor shall perform in place friction tests of the prestressing system to determine the actual friction and wobble coefficients for use on the project as well as strand modulus of elasticity tests. The number of strand per tendon and whether or not blank ducts will require strand will be determined based on the results of the testing as follows:

Tendon Modulus of Elasticity: For the purpose of accurately determining the tendon elongations while stressing, the Contractor shall bench test two samples of each size and type of tendon to determine the modulus of elasticity prior to stressing the initial tendon.

For the purpose of this test, the bench length between anchorages shall be at least 12 m and the tendon duct shall be at least 50 mm clear of the tendon all around. The test procedure shall consist of stressing the tendon at an anchor assembly with a load cell at the dead end. Tension the test specimen to 80% of ultimate in ten increments and then detension from 80% of ultimate to zero in ten decrements. For each increment and decrement, record the gauge pressure, elongations and load cell force. Note elongations of the tendon for both ends and the central 9 m, measured to an accuracy of ± 1 mm. Correct the elongations for the actual anchorage set of the dead end.

Calculate the modulus as follows:

$$E = \frac{P L}{A \Delta l}$$

where:

P= force in tendon,

L= distance between pulling wedges and dead end wedges (or exact length in center 9 m of the tendon).

A= cross sectional area of the tendon based on nominal area.

Δl = strand elongation for load P between the wedges (or strand elongation of the central 9 m of the tendon).

Reevaluate and correct the theoretical elongations shown on the post-tensioning shop or working drawings using the results of the test when the modulus of elasticity from the bench test varies from the modulus of elasticity used for the shop or working drawings by more than 1%. Submit revisions to the theoretical elongations to the Engineer for approval.

When the observed elongations of the tendons in the erected structure fall outside the acceptable tolerances or to otherwise settle disputes, additional Tendon Modulus of Elasticity Tests may be required to the satisfaction of the Engineer.

If the source of prestressing steel changes during the project, additional test series, not to exceed two per source, shall be required.

The apparatus and methods used to perform the test must be submitted to the Engineer for approval. Tests shall be conducted in the Engineer's presence.

CONSTRUCTION

In Place Friction Test: This test is intended to demonstrate that the friction characteristics, losses and resulting tendon forces are in agreement with the design assumptions.

For the purpose of verifying friction loss, the Contractor shall test in place, the first two pairs tendons installed of each size and type which are at least 15 m long. Size is defined as the number of strands, bars or wires in each tendon. Type is defined as to both prestressing and duct material and to the tendon function within the structure. Function is the general category of the tendon whether it is a cantilever tendon, continuity tendon, top slab or span tendon passing through one or more spans or segments, and shall include loop tendons in the footings. In this respect, the function of two or more tendons may be the same even though their actual profiles and lengths differ.

The test procedure shall consist of stressing the tendon in place within the structure at an anchor assembly with a load cell at the dead end. Tension the test specimen to 80% of ultimate tendon strength in ten equal increments and detention in ten equal decrements. For each increment and decrement, record the gauge pressure, elongations and load cell forces. Take into account any wedge seating in both the live end (i.e., back of jack) and the dead end (i.e., back of load cell) and of any friction within the anchorages, wedge plates and jack as a result of slight deviations of the strands through these assemblies. For long tendons requiring multiple jack pulls with intermediate temporary anchoring, keep an accurate account of the elongation at the jacking end allowing for intermediate wedge seating and slip of the jacks' wedges.

Conduct the test using the lubricants required, to meet the expected friction coefficient. If lubricants are required to achieve the coefficient, their use shall first be approved in writing by the Engineer in accordance with these special provisions. Lubricants shall be proven not to affect the bond of the prestressing steel to the grout in grouted tendons. Proof shall consist of documented test results and published papers using materials similar to those proposed for use with lubricants. Alternately, the Contractor may also propose a test program to demonstrate that the bond is not affected. A test program shall consist of at least four identical tendons, at least 15 meters long, two using lubricant and two without. In addition to providing documentation on affect on bond, the Contractor shall provide samples of proposed lubricants as requested by the Engineer for testing by the State.

If the elongations fall outside the $\pm 5\%$ range of the expected friction coefficients, the Contractor shall assume responsibility to investigate the reason and make revisions to post-tensioning operations so the final tendon forces are in agreement with the Plans. The conclusions of the investigation and all proposed changes to post-tensioning operations shall be detailed in a written report that shall be submitted to the Engineer for review and approval.

In reconciling theoretical and actual elongations, the expected friction and wobble coefficients shall not be varied by more than $\pm 10\%$. Significant shortfall in elongations is indicative of poor duct alignments and/or obstructions. Correct or compensate for such elongations in a manner proposed by the Contractor and reviewed and approved by the Engineer at no additional cost to the State.

Successful friction tests will be required for each pair of each type and size of tendon on the project.

If there are irreconcilable differences between forces and elongations, or other difficulties during the course of routine stressing operations, the Engineer may require additional in place friction tests to be performed.

The apparatus and a step-by-step procedure used to perform the test must be submitted to the Engineer for approval. All tests shall be conducted in the Engineer's presence. Six sets of the procedure and details shall be submitted to the Resident Engineer's Office at , for approval in accordance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. Sample calculations showing how the stressing data will be analyzed shall be included in the procedure submittal. After review, between 6 and 12 sets, as requested by the Engineer, shall be submitted to the said Office for final approval and for use during construction. The calculations shall be signed by a Civil Engineer registered in the State of California with proven experience in determining friction and wobble coefficients.

The Contractor shall be responsible for correction or adjustment of elongations using the results from friction tests.

Elongations and Agreement with Forces: The post-tensioning operation shall be conducted so that the forces being applied to the tendon and the elongations of the post-tensioned tendon can be measured at all times.

Elongations shall be measured to the nearest 2 mm. The elongations shall be recorded by the Contractor in a stressing record book on pre-prepared forms which show the expected elongation for each tendon. In addition to the information required on the forms by Section 5.10, "Post Tensioning Supervision," of the Division II Construction Specifications of the AASHTO Guide Specifications for Design and Construction of Segmental Concrete Bridges, the following information shall be recorded: the tendon size, length, location and duct type, the dates of strand installation, stressing and grouting, the strand pack number(s) of the strand in the tendon, strand manufacturer's modulus and area for the strand pack(s) in the tendon, the time at the start and finish of stressing, the location of jacking end and dead end, the air and structure temperature, the anchor set and the calculated error as a percent of the predicted elongation, the grout volume placed, the grout pressure, corrosion inhibitor or lubricants if used and any observed anomalies such as strand breakage. The complete stressing record book shall be available for review by the Engineer at any time and shall be submitted to the Engineer, by frame, upon stressing of the final tendon in each frame.

For the required tendon force, the observed elongation shall agree within plus or minus five percent of the theoretical elongation or the entire operation shall be checked and the source of the error determined and remedied to the satisfaction of the Engineer before proceeding further. When calculating error, the actual elongation shall be divided by the theoretical elongation, thus an acceptable ratio shall be greater than 95 percent but less than 105 percent. The tendon shall not be overstressed to achieve the theoretical elongation. For tendons that are two-end stressed, the elongation error shall be reported at the first stressing end, the second, and as a percent of the total first plus second end elongations. For the purpose of elongation acceptance for two-end stressed tendons, the first end observed elongation shall agree within five percent of the theoretical elongation.

In the event that agreement between the observed and the theoretical elongations at the required force falls outside the acceptable tolerances, the Contractor shall submit a plan of remedial action prior to stressing additional tendons. The Engineer may also, at his discretion and without additional compensation to the Contractor, require additional tests in accordance with "Tendon Modulus of Elasticity" and "In Place Friction Test."

Friction: The Contract Plans were prepared based on the assumed friction and wobble coefficients and anchor set noted on the Plans. The Contractor shall submit supporting calculations and, on the Working Drawings, show tendon force diagrams, after friction, wobble and anchor set losses, based upon the expected actual coefficients and values for the post-tensioning system to be used. Show these coefficients and values on the Working Drawings.

If, in the opinion of the Engineer, the actual friction significantly varies from the expected friction, the Contractor shall revise his/her post-tensioning operations so the final tendon force is in agreement with the Plans.

When friction must be reduced, water soluble oil or graphite may be used as a lubricant, subject to the approval of the Engineer. The Engineer shall have 2 weeks to review any lubricant proposed for use. Past evidence of successful use of the proposed lubricant as well as test information showing no loss of bond between the strand and the grout or the grout and the tendon walls shall be furnished with any lubricant proposed for use. Flush lubricants from the duct as soon as possible after stressing is completed by use of water pressure. Flush these ducts again just before the grouting operations. Each time ducts are flushed, immediately blow dry with oil-free air.

General.--

Cut-off of strand or bars at anchorages shall be by abrasive sawing only, flame cutting will not be allowed. Cut-off shall occur after approval of the stressed tendon by the Engineer.

Unused spare ducts for cantilever tendons, as shown on the plans, shall be grouted as directed by the Engineer at the completion of the cantilevers at any pier and prior to mid-span or hinge closure pours.

Exposed portions of anchorages and steel pipe deviators for future tendons shall be protected from corrosion by galvanizing in accordance with the requirements in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications. Extreme care shall be taken so that bends in pipe deviators conform to the radii shown on the plans and that the pipe deviators are properly positioned. The Contractor shall demonstrate to the Engineer that deviators are correctly positioned after concrete placement is complete by stringing piano wires along future tendon paths between anchorages and deviators. Improperly bent or positioned deviator pipes shall be rejected and shall be repaired or replaced by the Contractor.

All prestress blockouts and pourbacks shall be filled with nonshrink grout. Window box type forms shall be used to place nonshrink grout. The upper edge of the window box form shall be at least 150 mm above the top of the blockout or pourback and shall be wide enough to be able to insert a pencil vibrator to all locations within the blockout or pourback. Nonshrink grout shall conform to "Nonshrink Grout" of these special provisions. Prior to placing nonshrink grout in

prestressing anchorage blockouts within the pier footings, and within 12 hours after abrasive blasting, the concrete surfaces within the blockout shall be coated with an approved epoxy bonding agent. The bonding agent shall be applied in conformance with manufacturer's written recommendations and nonshrink grout shall be placed within the working time of the bonding agent as described herein. Within one to three days after stripping of the forms on all blockouts or pourbacks on the pier footings, the prepared concrete surface shall be coated with a rolled on epoxy sealer in accordance with the coating manufacturer's recommendations and as described herein. Prior to applying the epoxy, excess nonshrink grout shall be removed from the window box by light chipping and finish grinding to a flat smooth surface and the surface shall be brushoff blast cleaned. The area to be coated shall extend 250 mm outside the pourback in all directions. Removal of excess nonshrink grout shall be and shall not damage the nonshrink grout or surrounding concrete to remain. Where brushoff blast cleaning reveals excessive bug holes in the surface of the concrete, the Contractor shall secure the epoxy manufacturer's recommendations for filling of the holes prior to epoxy coating the surface. Completed epoxy sealed blockouts and pourbacks not meeting the thickness and bond requirements herein shall be rejected. All prestress strand or bars shall be grouted as quickly as possible, in accordance with these specifications and special provisions, to prevent corrosion of the prestressing steel. Where corrosion inhibitors are used to protect strand that has been placed into tendons for extended periods of time, the corrosion inhibitor shall have no deleterious effect on the bond between the steel and the grout. If corrosion is encountered, it will be corrected at the Contractor's expense.

Ducts in the pier footings and at exposed hinges, and elsewhere as directed by the Engineer, shall be capped with tight fitting plugs until loaded with strand. After loading with strand and until placement of the nonshrink grout pourbacks of the blockouts, the ends of all tendons and strand shall be covered with sturdy plastic covers to prevent saltwater contamination of the ducts or anchorages.

The two span tendons to be monitored shall be single tendons, one on each side of the box. The concrete pourbacks over the anchorages shall not be placed, but bar reinforcing shall be provided for future use in placing the pourback concrete. The tendon anchorages shall be fitted with removable stainless steel grout caps which cover both the load cells and the anchor head and fit tightly against the bearing plate. The two tendons shall not be grouted but shall have the capability of being grouted in the future via tapped, but plugged holes in the grout caps. The caps shall have penetrations to allow load cell wiring to pass out of the cap. After installation of the strand into the tendons, corrosion inhibitor shall be blown into the tendon as directed by the Engineer.

The details shown on the plans for cast-in-place prestressed box girder bridges are based on a combination of bonded partial length tendon and bonded full length draped tendon prestressing systems. The Contractor's attention is directed to the requirements for "Cost Reduction Incentive Proposals" elsewhere in these special provisions. For these bridges the Contractor may, in conformance with these special provisions, propose an alternative prestressing system which varies the percentage of each system providing the proposed system and associated details meet the following requirements:

- A. The proposed system and details shall provide moment and shear resistances at least equal to those used for the design of the structure shown on the plans. At every point in the bridge, the proposed system must provide an equivalent prestressing force to the combined sum of those on the "Force Diagrams" for the cantilever, span, continuity and top slab tendons shown on the plans.
- B. The concrete strength shall not be less than that shown on the plans.
- C. Anchorage blocks for partial length tendons shall be located so that the blocks will not interfere with the placement of the utility facilities shown on the plans or of any future utilities to be placed through openings shown on the plans.
- D. Temporary prestressing tendons, if used, shall be detensioned and the temporary ducts shall be filled with grout before completion of the work. Temporary tendons shall be either removed or fully encased in grout before completion of the work.
- E. All details of the proposed system, including supporting checked calculations, shall be included in the drawings submitted in conformance with the provisions in Section 50-1.02, "Drawings," of the Standard Specifications.

Moments and shears for loads used in the design shown on the plans will be made available to the Contractor upon written request to the Engineer. After written request, the Contractor shall allow 4 weeks for the loads to be furnished.

PAYMENT

Full compensation for furnishing and installing spare ducts, for grouting of spare ducts, for furnishing and installing additional prestressing strand to spare ducts, for sealing and plugging future tendons as shown on the plans, for designing, detailing and submitting working drawings for anchorages when spare ducts are to be utilized, for testing strand modulus, for in-place friction testing, and for pre-qualifying systems for use in lightweight concrete and for post tensioning anchorage systems prequalification testing shall be considered as included in the lump sum price paid for prestressing cast-in-place concrete and no additional compensation will be allowed therefor.

Full compensation for prestressing grout, epoxy bonding agent, and epoxy surface sealer in accordance with this special provision shall be considered as included in the lump sum price paid for prestressing cast-in-place concrete and no additional compensation will be allowed therefor.

Full compensation for installing loads cells behind wedge anchor plates at instrumented span tendons, for coordinating the load cell and group cap details with the monitoring designer, for furnishing and placing stainless steel grout caps at these tendons and for blowing-in and providing corrosion inhibitor shall be considered as included in the lump sum price paid for prestressing cast-in-place concrete and no additional compensation will be allowed therefor.

10-1.44 PRESTRESSING HIGH STRENGTH ROD

High strength rod assemblies consisting of grouted high strength rods, bearing plates, anchorage devices, and incidentals shall conform to the details shown on the plans, to the provisions in Section 50, "Prestressing Concrete," of the Standard Specifications, to the provisions in "Prestressing Concrete" of these special provisions for the submittal of drawings and for prestressing, and to these special provisions. Prestressing high strength rod assemblies are located at Hinges C and D, the Span 17 hinges and include all the superstructure vertical prestressing rods as shown on the plans.

Attention is directed to "Order of Work," and "Integrated Drawings" of these special provisions for submittal of 75 mm sample bars for testing.

High strength rod assemblies shall conform to the materials and sampling requirements in Section 50-1.05, "Prestressing Steel," of the Standard Specifications and the following:

The high strength rods shall be sheathed full-length between anchor plates with corrugated galvanized steel ducts. The ends of the ducts shall be sealed against grout leakage. The space between the sheathing and the bar shall be pressure grouted after stressing. For horizontal applications where both anchorages are accessible, grout shall be injected from one anchorage toward the other. For horizontal applications where one anchorage is inaccessible and cast into concrete, a grout injection hose shall be provided at the buried end near the anchorage that will allow grout to be injected from the buried end so that it flows toward the accessible end. For vertical applications, grout shall be injected through a grout injection hose near the bottom anchorage so that it flows upwards toward the upper anchorage. In addition, where pocket formers are used to form recesses in the bridge deck a separate grout hose outside the limits of the pocket will not be allowed (the grout hose must attach to a threaded hole in the anchorage plate within the pocket formed hole).

Anchorage devices and couplers, conforming to the requirements specified herein, shall be of a type selected by the Contractor and shall include locking devices to prevent turning or loosening at the coupler.

The Contractor shall be responsible for determining the required lengths of the high strength rod assemblies.

The high strength rod assemblies shall be shipped as a complete unit including end plates, nuts and washers, ducts, grout injection hoses and pocket formers (if applicable).

The high strength rods shall be prestressed to the stressing values shown on the plans. Prestressing shall conform to the provisions in Section 50-1.08, "Prestressing," of the Standard Specification and these special provisions.

Bearing plates shall conform to the requirements of ASTM Designation: A 709, Grade 345.

Before any production material is ordered, three 1.5 m long-75 mm high strength rods shall be delivered to the Transportation Laboratory at the Contractor's expense for testing and approval by the Engineer. These rods shall be from the same manufacturer that will furnish the production rods. In addition, three sample 75 mm high strength rods, 1.5 m long, for each heat of rods to be used on the project shall be delivered to the Transportation Laboratory at the Contractor's expense for testing. In addition,. The Office of Materials Engineering and Testing Services is located at 5900 Folsom Boulevard, Sacramento, CA 95819, telephone (916) 227-7000. Rods should be shipped to Mr. Ken Pinkerman. Each rod shall be furnished with two nuts and two washers identical to those that will be used in the field. The samples will be tested by the Transportation Laboratory for compliance with the requirements specified in ASTM A722 and these special provisions. Sample test results will be reported to the Contractor within 10 working days of delivery to the Transportation Laboratory. The test report will be made for the group of samples. If the results of tests exceed the permissible variations of ASTM A722, all material planned for use from the heat represented by said samples shall be subject to rejection.

On the bridge deck, the recesses formed by the pocket formers shall be abrasive blast cleaned after stressing and grouting is complete in accordance with the requirements of "Nonshrink Grout," elsewhere in these special provisions, except that the sides of the recess shall be roughened to 6mm amplitude. The side of the recess and all exposed portions of the prestressed high strength rod and anchorage plate shall be coated with an epoxy bonding adhesive just prior to filling the hole with nonshrink grout and in accordance with the manufacturer's requirements. Nonshrink grout shall conform to the requirements of "Nonshrink Grout," of these special provisions. The Contractor's attention is directed to the curing requirements for nonshrink grout elsewhere in these special provisions. The Contractor shall demonstrate his procedure for preparing the recesses, applying the epoxy and placing the nonshrink grout to the Engineer on the first dozen recesses filled. The Engineer will determine the acceptability of the procedure based on the demonstration. Once approved by the Engineer, the demonstration pocket fillings shall be the standard by which future pockets fillings are approved.

All high strength rods shall be pressure grouted unless shown otherwise on the plans. Grout for pressure grouting shall conform to the requirements in "Prestressing Concrete," of these special provisions.

Epoxy bonding adhesive shall be a 3-component water based epoxy resin/portland cement bonding agent applied to all surfaces of the recess and anchorage in accordance with the manufacturer's written instructions. The bonding agent shall be compatible with and manufactured by the same manufacturer of the nonshrink grout. The Contractor shall provide a training session for the Contractor's employees responsible for patching the pockets and attended by the nonshrink grout/epoxy bonding adhesive manufacturer's representative and the Engineer. The procedure for preparing the pocket, for applying the epoxy adhesive, for mixing and pouring the nonshrink grout and for curing the grouted pocket shall be detailed at the training session. The training session shall conclude with the demonstration of the procedures on some actual holes as outlined above. The nonshrink grout/epoxy bonding adhesive manufacturer's representative shall certify in writing that the manufacturer's instructions have been followed in mixing and applying both the epoxy and the non-shrink grout at the demonstration.

The contract lump sum price paid for prestressing high strength rods shall include full compensation for furnishing all labor, material, tools, equipment and incidentals, and for doing all work involved in furnishing, placing and tensioning the high strength rods, complete in place, including providing 75 mm sample bars, holding training sessions and for preparing and filling pocket forms with nonshrink grout, as shown on the plans, as specified in these specifications, and as directed by the Engineer.

10-1.45 CONCRETE STRUCTURES

Portland cement concrete structures shall conform to the provisions in Section 51, "Concrete Structures," of the Standard Specifications and these special provisions.

GENERAL

Shotcrete shall not be used as an alternative construction method for reinforced concrete members unless otherwise specified.

When a roughened concrete surface is shown on the plans or called for in these special provisions, the existing concrete surface shall be roughened to a minimum amplitude of 6 mm by abrasive blasting, water blasting or mechanical equipment. The interior and top sides of the concrete footing forms, if used by the Contractor, whether cast-in-place or precast, shall be roughened.

Where the Contractor elects to use construction joints to place mass concrete in lifts, the joints shall be prepared in accordance with 51-1.13, "Bonding," of the Standard Specifications except at locations where epoxy coated bar reinforcing is shown on the plans. At these locations, the surface of the concrete shall be cleaned using high pressure water blasting using potable water. Abrasive blast methods shall not be used on construction joints with epoxy coated bar reinforcing passes through the construction joint. Water blasting shall commence within 24 hours of having placed the concrete and as soon as the concrete can be cleaned without washing cement from the surface matrix.

Neoprene strip shall be furnished and installed in conformance with the details shown on the plans, the provisions in the Standard Specifications, and these special provisions.

Furnishing and installing neoprene strip shall conform to the requirements for strip waterstops as provided in Section 51-1.145, "Strip Waterstops," of the Standard Specifications, except that the protective board will not be required.

Materials for access opening covers in soffits of new cast-in-place concrete box girder bridges shall conform to the provisions for materials in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications.

Plastic pipe located at vertical drains used behind retaining walls and bridge abutments, including horizontal or sloping drains shall be polyvinyl chloride (PVC) plastic pipe, Schedule 80, conforming to the provisions for pipe for edge drains and edge drain outlets in Section 68-3.02, "Materials," of the Standard Specifications. The vertical drain pipe shall be rigidly supported in place during backfilling operations.

The first paragraph of Section 51-1.20, "Sidewalks, Curbs and Stairways on Structures," of the Standard Specifications is amended to read:

- The concrete shall be finished in conformance with the provisions for finishing surfaces in Section 73-1.06, "Sidewalk, Gutter Depression, Island Paving, Curb Ramp (Wheelchair Ramp), and Driveway Construction," except that surfaces shall not be marked.

Embedded sleeves to form holes through the deck for future connections of barrier and transit rails, as shown on the plans, shall be PVC pipe. Sleeves shall be capped flush with the top mat of bar reinforcing steel. A plug attached to the forms shall be used to secure the sleeve to the form. The sleeves shall be securely tied in place so that they will not be displaced during concrete placement. After removal of the forms, the Contractor shall remove all plugs from the sleeves and demonstrate that the sleeves are unobstructed by inserting bar into each hole. Obstructed or incorrectly positioned sleeves shall be replaced or repaired as approved by the Engineer.

Embedded sleeves to form holes through the deck for electrical conduits, as shown on the plans, shall be PVC pipe. Sleeves shall be securely tied in place so that they will not be displaced during concrete placement.

Where 150 mm pier cap diaphragm openings are shown on the plans, the openings shall be formed by embedding a length of 150 mm inside diameter rigid galvanized steel pipe electrical conduits conforming the requirements of Section 86-2.05A, "Material", of the Standard Specifications. The conduit shall be stubbed out from the diaphragm 150 mm on each side, or, alternately, shall be fitted with threaded couplings on either end which are flush with the face of the diaphragm. If the Contractor elects to use pipe with couplings, the threads of the couplings shall be protected from concrete. Rigid galvanized steel pipe shall be secured in place so that it is not displaced during concrete placement.

Ferrule loop type anchor inserts for future maintenance travelers shall conform to the details shown on the plans, and "Miscellaneous Metal" of these special provisions.

Concrete used to fill the annular space between the CIDH and the isolation casings shall be minor concrete conforming to the requirements of Section 90-10 "Minor Concrete," of the Standard Specifications.

Where called for on the plans and as directed by the Engineer, expanded polystyrene used to form gaps shall be removed from joint areas and around bearings. Removal shall be done in an approved manner without the use of solvents and such that the debris is contained and collected for disposal.

All forms inside the superstructure of both the segmentally constructed portions and the conventionally constructed portions of the bridge and inside all hollow piers shall be removed. The inside of the superstructure of both the segmentally constructed portions and the conventionally constructed portions of the bridge shall be swept clean to remove all debris after stripping of the forms and all surfaces shall receive an ordinary surface finish in accordance with the requirements of Section 51-1.18A, "Ordinary Surface Finish," of the Standard Specifications.

For tremmie concrete placed under water at seal courses, the tremmie tube shall be equipped with an inflatable bladder or other device which closes the end of the tube when it is necessary to lift or reposition it during the pour.

The Contractor's attention is directed to "Span 17 Cooperation" of these special provisions regarding grinding performed under this contract across hinges A and B into Contract EA 04-006061.

The waterstop shown on the plans at the footings shall conform to the provisions in Section 51, "Concrete Structures," of the Standard Specifications and these special provisions:

The waterstop shall be a 152.4 mm x 9.5 mm center-bulb type with parallel ribs or protrusions on each side of strip center. Corrugated or tapered type water stops are not acceptable. Minimum weight per meter of water stop shall be 2.42 kg.

The waterstop shall be polyvinyl chloride (PVC) formulated to perform in contact with salt water. The waterstop shall conform to the following requirements:

Property	Testing Method	Required Limits
Water Absorption	ASTM D 570	5% max.
Ultimate Elongation	ASTM D 628	360 %
Stiffness in Flexure	ASTM D 747	4.14 Mpa
Specific Gravity	ASTM D 792	1.4 max.
Volatile Loss	ASTM D 1203	0.50% max.
Hardness, Shore A/15	ASTM D 2240	65 to 80
Tensile Strength After Accelerated Extraction	CRD-C 572	11.03 Mpa
Elongation After Accelerated Extraction	CRD-C 572	300 % min.
Effect on Alkali after 7 Days	CRD-C 572	Passed
	Weight Change	+0.25% max. -0.0% max.
	Hardness Change	± 5 max.

Waterstop shall be provided with embedded wire or grommets at the edges in order to secure the waterstop at the locations detailed on the plans. The waterstop bulb shall be centered in the gap during and at the end of construction. Holes made in waterstops without grommets shall not be allowed.

Waterstop splices shall be not be pulled or strained in any way for at least 10 minutes after they are welded.

Finished splices shall provide a cross-section that is dense and free of porosity with tensile strength of not less than 80 percent of the unspliced materials.

MASS CONCRETE

All concrete used in the new Benicia Martinez Bridge's 2.5 m or 2.6 m CIDH concrete pilings, the pier footings (including precast pier footing forms), the piers, the pier tables and the first four segments of each segmentally constructed pier, as well as any portions of the bridge where the concrete being placed has a minimum dimension that exceeds 2 m and, at the Contractor's option, other concrete shall conform to the provisions in Section 90, "Portland Cement Concrete," of the Standard Specifications and these requirements for mass concrete.

The Contractor shall be responsible for controlling the internal temperature of mass concrete during curing to control and limit thermal cracking due to heat generation and dissipation. Use of ice, liquid nitrogen, insulated curing blankets, insulated forms, cooling pipes and other measures may be necessary to satisfy the temperature requirements of this special provision. A post-cooling backup system is required to be designed and installed by the Contractor in accordance with these special provisions.

The Contractor's attention is directed to several reports prepared for this project regarding mass concrete which may be obtained from the State as a part of the "Materials Handout". The reports contain suggested guidelines and recommendations for controlling thermal cracking of mass concrete on this project. The Material Handout will be made available at the Department of Transportation, Plans and Bid Documents, Room 0200, Transportation Building, 1120 N Street, P.O. Box 942874, Sacramento, California 94274-0001, Telephone No. (916) 654-4490.

Materials–

- A. The amount of free water used in mass concrete in footings and piers shall not exceed a water to cementitious materials ratio of 0.40.
- B. Either Type A admixture or a Type D admixture conforming to the requirements of ASTM Designation: C 494 and Section 90-4, "Admixtures," of the Standard Specifications shall be used at such dosage that will produce a workable concrete suitable for its intended use. The admixture at such dosage shall not cause an increase in drying shrinkage of the mass concrete in excess of that permitted in ASTM Designation: C 494.
- C. The temperature of the concrete at time of discharge from the mixer shall not exceed that determined by the Contractor's thermal control plan as required herein. The minimum temperature requirements of Section 90-6.02, "Machine Mixing," of the Standard Specifications will not apply. When ice is used, all the ice shall be melted before discharging the concrete from the mixer. The maximum internal temperature of the mass concrete once placed shall not exceed 65°C and the maximum temperature difference between any surface of the mass concrete and the hottest portion shall not exceed that determined by the Contractor's thermal control plan as required herein.

Thermal Control Plan

Temperature modeling and temperature monitoring shall be required for each typical placement of mass concrete. The Contractor's thermal control plans shall be designed to keep thermal cracking below the limits specified for the various elements specified herein. The Contractor shall submit to the Engineer a temperature control plan for each typical concrete placement, as described herein. The thermal control plan shall include working drawings, with design calculations, for the proposed pre-cooling of materials, concrete placement, post-cooling system (where required herein), and the temperature monitoring and recording system for each typical mass concrete placement. A typical placement shall be defined as a mass concrete pour of similar dimensions in a similar location within the structure.

A thermal control plan shall be completed and approved by the Engineer for each typical mass concrete location before any concrete represented by that plan is placed. Mix designs for mass concrete shall not be approved until the thermal control plan for placements utilizing that mix are submitted and approved. The proposed post-cooling system and the temperature monitoring and recording system shall be designed by a licensed engineer with experience in modeling heat build up and in designing cooling systems to control heat build up in mass concrete elements. The design calculations shall adequately demonstrate that the mass concrete acceptance criteria of these special provisions and any supplemental criteria proposed for use by the Contractor are both satisfied.

Temperature modeling for each typical placement shall be included with each thermal control plan submittal. As a minimum, the modeling for each typical placement shall consist of performing a two-dimensional finite-difference analysis (see ACI 207.1R-96). The analysis shall be based on the Contractor's actual mix designs. The coefficient of thermal expansion of the concrete used in the modeling shall be determined by testing of the proposed mixes in accordance with US

Army Corps of Engineer's Method CRD-C39-81, "Test Method for Coefficient of Linear Thermal Expansion of Concrete." The heat of hydration used in the modeling for the cementitious blend used in the proposed mix designs shall be tested at 1, 3, 7 and 28 days in accordance with ASTM C186, "Heat of Hydration of Hydraulic Cement" or another approved method.

Thermal Control Plan requirements for each typical mass concrete placement:

1. Dimensions of each typical mass concrete placement, including all locations in the structure to be represented by that placement.
2. Types and dimensions of materials to be used for mass concrete forms and insulation, and time frames for when the concrete forms and insulation will be removed, including time periods for removal and reinstallation of insulation where required as a part of the thermal control plan.
3. Assumptions for average ambient air and average surface water temperature for time period of placement and curing of each typical mass concrete element.
4. Define time delay between placing seal course and pier footing concrete, where applicable.
5. For piers, if multiple lifts with time delay are proposed, provide lift height and define time delay between lifts.
6. Define the length of time or at what temperature in the concrete footing will ocean water be allowed back into the cofferdams around the new mass concrete footings, if cofferdams are used.
7. Include a placing diagram showing the typical mass concrete placement sequence and construction joint locations, if any.
8. Identify areas where steep cooling gradients may occur, which may result in cracking the mass concrete, and how they will be avoided or minimized.
9. Predict peak temperature, peak differential temperatures and at what approximate times they will occur.
10. Define allowable time periods for placing or removing insulation and or forms.
11. A summary of the modeling assumptions used in the analysis.
12. Identify contingency operations to be implemented to control the internal temperature of the concrete should the maximum allowable or the maximum allowable differential temperature be exceeded. For post cooling systems after the peak internal temperature is reached, include the maximum cooling rate at which cracking will not occur.

The working drawings and design calculations for each typical mass concrete placement shall conform to the requirements in Section 5-1.02, "Plans and Working Drawing," of the Standard Specifications. The number of sets of drawings and times for review for each typical mass concrete element shall be the same as specified for falsework working drawings in Section 51-1.06A, "Falsework Design and Drawings," of the Standard Specifications, except that two sets of calculations shall be submitted.

Approval by the Engineer of the Contractor's proposed pre-cooling materials, if used, concrete placement, post-cooling system and proposed temperature monitoring and recording system for each set of typical mass concrete placement's working drawings and design calculations or field inspection performed by the Engineer will in no way relieve the Contractor of full responsibility for placing, curing and repairing excessive cracking in each mass concrete element.

Any adjustments made to a previously approved mix design for mass concrete and/or a change to a thermal control plan for a typical placement, shall require resubmittal of that thermal control plan for approval. The review time for resubmitted thermal control plans shall be 3 weeks.

Should the Engineer fail to review the complete working drawing submittal within the time specified and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in reviewing the working drawing submittal, an extension of time commensurate with the delay in completion of the work thus caused will be granted in accordance with Section 8-1.09, "Right of Way Delays," of the Standard Specifications. No extensions of time will be given for resubmittal of any previously approved temperature control plans.

Temperature Monitoring and Recording—

The Contractor shall design and implement a temperature monitoring and recording system for each mass concrete placement. Temperature shall be monitored in all mass concrete placements in accordance with these special provisions and as directed by the Engineer.

Concrete temperatures shall be monitored using thermocouples at all mass concrete placements. Other types of temperature measuring devices may be considered provided they have a history of successful use in past concrete temperature monitoring programs, as determined by the Engineer. Thermocouples shall be located as recommended in the "Materials Handout" prepared for this project and as necessary to verify the Contractor's temperature modeling. The "Materials Handout" will be made available at the Department of Transportation, Plans and Bid Documents, Room 0200, Transportation Building, 1120 N Street, P.O. Box 942874, Sacramento, California 94274-0001, Telephone No. (916) 654-4490. Secondary thermocouple trees shall be used adjacent to the primary trees to account for possible defective or damaged units, though only one set need be monitored. The average ambient air temperature and the average water temperature (if the concrete is placed with a face of the form exposed to water) shall also be recorded. Temperature readings shall be automatically recorded on an

hourly basis and average ambient air temperature shall be calculated by averaging hourly job-site temperatures over a period of several days before and after specific concrete placements..

Temperature monitoring may be discontinued when the interior concrete temperature at any location within the concrete element being monitored minus the coldest nighttime air temperature adjacent to the element for the three previous consecutive days is less than the maximum allowable temperature differential determined in the Contractor's thermal control plan. Upon evidence of consistent reliability of the primary thermocouple trees at the first 10 mass concrete placements, the requirement for redundant thermocouple trees may be reduced or eliminated at the discretion of the Engineer.

Wiring from thermocouples that must be cast into the concrete shall be protected in steel or plastic conduits that are securely tied to the bar reinforcing to prevent movement. Wire runs shall be as short as possible. The ends of the thermocouples shall not come into contact with either a support or concrete form, or bar reinforcing steel.

Temperature monitoring equipment shall be capable of printing and data storage and shall be able to download monitoring data to a computer. Recording instruments shall be stored in a heavy duty tamperproof box and readings shall be downloaded daily and reported to the Engineer. During monitoring, should the maximum allowable internal temperature of the mass concrete be exceeded or the maximum allowable temperature difference between any surface of the mass concrete and the hottest portion be exceeded, the Contractor shall implement the contingency measures in accordance with his approved thermal control plan.

Working drawings for the temperature monitoring and recording system for each mass concrete placement shall include:

1. Type and description of equipment to be used in the temperature monitoring and recording system.
2. Detailed layouts for all thermocouples in each mass concrete placement.
3. Details to support the thermocouples at fixed locations and precautions to be taken so that the support, reinforcement, or type of concrete forms do not influence results of the temperatures by acting as a heat sink.
4. Details of computer printout spreadsheet and graphs for temperatures at each thermocouple and temperature differentials between thermocouples for each typical mass concrete placement.

The records and graphs of the temperatures and temperature differentials for each mass concrete element placed shall be signed by the Contractor's engineer, and a copy of the record shall be delivered to the Engineer at the end of each day of the monitoring period starting on the day after the mass concrete placement has been completed. At the completion of monitoring, the actual readings for the mass concrete element shall be compared with those predicted by the modeling and a summary report prepared by the Contractor's Engineer. The report, signed by the Contractor's engineer, shall include all supplementary or contingency measures implemented and suggested corrections to any future modeling or monitoring to be performed. The summary report shall contain all the temperature data collected for each instrument, both in hardcopy and in a digital form on diskette. Digital data shall be in Microsoft Excel format or as otherwise approved by the Engineer. The summary report shall also have the data shown in a graphical format with all instruments for a given mass concrete element shown on the same page with time as the horizontal axis. The summary report shall be submitted within one week of completing the monitoring of the mass concrete element.

Post-Cooling System for Mass Concrete--

The Contractor shall design and install a post-cooling pipe system when either of the following conditions are met:

CONDITION A. At the first mass concrete placement for each typical placement.

CONDITION B. As determined by the Contractor's temperature control plan for each typical mass concrete placement.

For Condition A only, if the Contractor meets the acceptance criteria on the initial typical mass concrete placement without the use of coolant circulation, installation of a pipe cooling system will not be required for the remaining elements represented by that typical mass concrete placements provided the environmental conditions remain within the assumed values.

If the Contractor's design calculations for a typical placement determine that a cooling pipe system is not necessary to control internal concrete temperatures, then the Contractor shall design and install a cooling pipe system to provide minimal cooling capacity. Minimal is defined as cooling pipe system that will reduce temperature gradient by at least 5 degrees C.

If the post-cooling system is required by the Contractor's design calculations for a typical placement, the Contractor shall design and install a post-cooling system. The post-cooling system shall either be an embedded cooling pipe system or a concrete lift system, but not a combination of both within a typical mass concrete placement. Attention is directed to "Concrete Structures" of these special provisions for water blasting preparation of construction joints at concrete lifts where epoxy coated bar reinforcing is being used.

Additional requirements in the working drawing when a post-cooling system is required:

1. Detailed layout of proposed embedded cooling pipe system, including pipe spacing, coolant temperature and rate of flow, and approximate duration of cooling.
2. Item list of embedded cooling pipe system materials. Details to support the cooling pipes at fixed locations.

If the contractor uses an embedded cooling pipe system, the following elements are required:

1. Forms shall be designed so that shutdown of cooling or temperature recording activities is not necessary if forms are removed.
2. The Contractor shall provide thermometers to measure coolant temperatures at supply and return manifolds.

Cooling pipes may be polyvinyl chloride (PVC) or steel pipes or some other material, but shall not be aluminum, copper or any other dissimilar metal that can cause a corrosion cell with the steel reinforcing. Surface connections to the cooling pipes shall be removable to a depth of 100 mm after they are no longer needed. Cooling pipes shall be satisfactorily secured to bar reinforcing steel to prevent movement or damage during mass concrete placement.

Cooling water may be sea water. If sea water is used it shall be filtered to remove sediment which could clog the pipes or control valves. The Contractor shall conform with local, state, and national environmental codes for the discharge of cooling water into the Bay.

Prior to the placement of the mass concrete, the cooling pipe system shall be pressure tested by the Contractor in the presence of the Engineer for leaks at 120 percent of the maximum pressure it will receive during use. The test pressure shall be held for 15 minutes. All leaks shall be repaired and the cooling pipe system retested by the Contractor in the presence of the Engineer until satisfactory results are obtained.

Construction.—

The Contractor shall install the thermocouples, temperature monitoring and recording systems, thermocouple supports, and formwork in accordance to the approved working drawings and design calculations in the Thermal Control Plan and as required by these special provisions.

The post-cooling temperature monitoring and recording systems shall be inspected on a daily basis and a report shall be issued in writing on the status of each system. A copy of the daily reports shall be available at the site of the work at all times. Should an unplanned event occur, the Contractor shall take action immediately to correct or remedy the occurrence and report same, in writing, to the Engineer.

In addition, the following requirements shall apply to coolant circulation:

For CONDITION A, coolant circulation shall be activated as determined by the Contractor, unless otherwise directed by the Engineer.

For CONDITION B, coolant circulation shall either have the coolant circulation in progress or the cooling pipes shall be filled with coolant at the time concrete placement begins. The Contractor shall state in the working drawings at what time or what temperature the coolant shall be circulated.

After the mass concrete pour has been topped out and finished it shall be revibrated and refinished. Revibration shall extend below the top mat of reinforcement and shall be done as late as the concrete will again respond to vibration. For concrete pours without top reinforcement, revibration shall extend to a depth of 150 mm.

During the period of early heat generation and temperature rise, pipe cooling shall be carried out as vigorously as the system permits. In general, when the mass concrete has reached its peak temperature, cooling shall be continued at a rate such that the concrete temperature drop generally does not exceed 0.6°C per day. When this desired rate of temperature change is exceeded, post-cooling operations shall be stopped until the temperature rises again. Cooling shall resume when concrete temperature exceeds the initial peak temperature and is predicted to continue to increase to unacceptable levels.

After cooling has been completed and the cooling pipes are no longer needed, they shall be thoroughly flushed with potable water and grouted full with the same grout and the same procedures as required for filling prestressing tendons in "Prestressing Concrete" of these special provisions.

After surface connections to the cooling pipe are removed, the holes shall be prepared and filled with nonshrink grout in the same fashion as the pocket recesses for the high strength rods in "Prestressing High Strength Rod" of these special provisions. Nonshrink grout for filling the recesses shall conform to "Nonshrink Grout" of these special provisions.

Acceptance Criteria for Mass Concrete—

Failure to meet the maximum temperature requirements herein for any placement of mass concrete will be cause for rejection of that mass concrete. In addition, cracking in mass concrete in excess of that specified herein, will be cause for the Engineer to suspend further work on members of similar size and configuration; and to require from the Contractor an explanation of the thermal cracking, and that additional steps be taken in the future to eliminate excessive cracking.

If the Contractor fails to meet any of the mass concrete acceptance criteria specified herein, as determined by the Engineer, the typical mass concrete element placement will be rejected on the basis that the internal temperature of the mass concrete and attendant volume change was not controlled adequately.

The Contractor shall remove all equipment and materials from the mass concrete element and clean the surfaces as necessary for the Engineer to measure the surface crack intensity. Surface crack intensity will be determined after monitoring shows the maximum internal temperature has dropped to within 5°C of the average outer concrete temperature. Cracking shall be considered excessive if a surface crack intensity on any face of a concrete surface, where cracks greater than 0.15 mm in width, measure more than 1.0 m in cumulative length within any 2m square area. If the Engineer suspends work due to excessive cracking, the Contractor shall submit proposed modifications in writing to the Engineer for review; concreting may not resume without the approval of the Engineer of the proposed modifications.

In addition, thermal cracking (cracks greater than 0.15 mm in width) shall be repaired using pressure injected epoxy. Prior to epoxy injection, cracks shall be cleaned of all loose material. All portions of the cracks which are wider than 0.1mm shall be completely filled with epoxy.

Core drilling may be necessary, as determined by the Engineer and at the Contractor's expense, to sample and examine the extent of the cracking and or crack repairs. The minimum depth of core sampling for mass concrete will be 0.6 meters and the number of cores taken per mass concrete element shall be in accordance with ASTM Designation: C 823. Prior to coring, the Contractor shall identify the location of the main reinforcing steel. The holes shall be cored by methods that will not shatter or damage the concrete adjacent to the holes. Water for core drilling operations shall be potable water. Immediately after coring, the concrete cores shall be identified by the Contractor with a description of the core locations and submitted to the Engineer for inspection.

If any reinforcement is cut during coring, coring operations shall be terminated, and the Contractor shall submit to the Engineer for approval, the procedure proposed to repair the cut reinforcement and to prevent further cutting of reinforcement. All cored holes shall be filled with nonshrink grout conforming to "Nonshrink Grout," of these special provisions. Cracks not showing full penetration with epoxy shall be reinjected

LIGHTWEIGHT CONCRETE

Lightweight concrete shall be composed of portland cement, lightweight coarse aggregates, fine aggregates, admixtures, and water, proportioned and mixed in accordance with the requirements of ACI 211.2, "Standard Practice for Selecting Proportions for Structural Lightweight Concrete," and as specified in these special provisions. Portland cement, water, and admixtures used in lightweight concrete shall conform to the provisions in Section 90, "Portland Cement Concrete," of the Standard Specifications and these special provisions.

For lightweight concrete only, the 2nd paragraph of Section 90-6.02, "Machine Mixing," of the Standard Specifications is amended to read:

- The temperature of mixed lightweight concrete, immediately before placing, shall be not less than 10°C nor more than 20°C. Aggregates and water shall be heated or cooled as necessary to produce concrete within these temperature limits. Neither aggregates nor mixing water shall be heated to exceed 65°C. If ice is used to cool the concrete, discharge from the mixer will not be permitted until all ice is melted.

For lightweight concrete only, the first sentence of the 2nd paragraph of Section 90-9.01, "General," of the Standard Specifications is amended to read:

- The compressive strength of concrete will be determined from test cylinders which have been fabricated from concrete sampled in accordance with California Test 539, except that the cylinders shall be 102 x 203 mm. Compressive strength acceptance of lightweight concrete shall be based on 102 x 203 mm cylinders.

Concrete for the superstructure between the pier tables (except Frame 4 superstructure) and for the edge beam shall be lightweight concrete. The same mix design shall be used for all lightweight concrete.

The fine aggregate portion of the lightweight concrete mix shall consist of lightweight fine aggregate or of natural sand conforming to the requirements of ASTM C 33 or manufactured sand fine aggregate, or a combination thereof, as required to comply with the air-dry unit mass requirements of these special provisions.

Attention is directed to "Segmentally Erected Superstructure" of these special provisions for pre-28-day compressive strength requirements for lightweight concrete used in the superstructure. Lightweight concrete shall have not less than the 28-day compressive strength shown on the plans. Lightweight portland cement concrete shall contain chemical and mineral admixtures in accordance with Section 90-4, "Admixtures," of the Standard Specifications. The water to cementitious material ratio shall not exceed 0.40. Lightweight concrete shall contain air entraining admixtures in accordance with Section 90-4.06, "Required Use of Air-entraining Admixtures," of the Standard Specifications. The air content of lightweight concrete shall be 6.0 percent, plus or minus 2 percent.

Prequalification by the submission of certified independent laboratory test data and trial batch test reports in conformance with the provisions in Section 90-9, "Compressive Strength," of the Standard Specifications will be required for lightweight concrete. In addition to design for strength, the lightweight concrete mix for the segments and edgebeam shall be designed to achieve the following additional properties:

Modulus of Elasticity-The modulus of elasticity of lightweight portland cement concrete shall be at least 23,440 MPa at 28 days when tested in accordance with ASTM C 469. The samples shall be moist cured for seven days, followed by air drying at 23°C and 50% relative humidity until test age. The modulus shall also be reported at 3, 7 and 90 days. Test results shall be based on the average of three test specimens at each age. All specimens in a given sample shall be taken from the same batch of concrete.

Creep-The specific creep coefficient, as determined in accordance with ASTM C 512, after 365 days of loading, shall not exceed 70 millionths/MPa. The test cylinders shall be loaded at 28 days to a stress of 20 to 40% of the 28-day design compressive strength shown on the plans. For submittal of prequalification data, coefficients after 28, 56 and 90 days of loading shall be submitted and used to predict the coefficient at 365 days based on the procedures of CEB-FIP Model Code for Concrete Structures, by the Comité Euro-International de Béton. Approval of the mix design shall be contingent upon the 365-day creep coefficient satisfying the stated requirement.

Shrinkage-The shrinkage strain of lightweight Portland cement concrete shall not exceed 0.05% after 180 days of drying in accordance with ASTM C 157. Sample size shall be 100x100x285 mm. The samples shall be moist cured for 7 days followed by air drying at 23°C and 50% relative humidity.

Tensile Strength-The tensile strength of lightweight portland cement concrete shall be not less than 3.2 MPa at 14 days, 3.4 MPa at 28 days and 3.6 MPa at 90 days when tested in accordance with ASTM C 496. The samples shall be moist cured for 7 days followed by air drying at 23°C and 50% relative humidity until test age.

The prequalification data or reports required herein and the proposed mix design, shall be furnished to the Engineer, in writing, not less than 150 days in advance of placing lightweight concrete. The mix design shall list the type, brand, mass, and absolute volume of each ingredient for each type and strength of concrete proposed for use. The mass for each aggregate shall be reported in a surface dry condition, including moisture absorbed in the aggregate, or oven-dry condition, or for the condition proposed for use, and shall be adjusted at the time of batching to compensate for surface moisture and for absorbed moisture. The batching equipment shall be subject to approval by the Engineer. The mix design shall be accompanied by written verification that arrangements have been made for the Engineer to obtain samples as required for testing purposes. Samples of lightweight aggregates will not exceed 230 kg for each separate grading.

The absolute volume of coarse aggregate shall be limited to that volume which permits the mixing, transporting, placing, consolidating, and finishing of the concrete without segregation. The air-dry unit mass of lightweight concrete furnished for each mix design used shall be a single mass, selected by the Contractor, within the limits of 1922 kilograms plus 0 or minus 80 kilograms per cubic meter. The Contractor shall furnish certified copies of the manufacturer's test reports showing the fresh concrete unit mass that is anticipated to result in the air-dry unit mass selected by the Contractor. The unit mass of fresh concrete produced for use in the work shall not vary from the mass shown in the test report by more than 65 kg per cubic meter and it shall not exceed 2002 kg per cubic meter. The unit mass of fresh concrete shall be determined in conformance with the requirements in California Test 518. The air-dry unit mass shall be determined in conformance with the requirements in ASTM Designation: C 567, except that the drying time shall be 90 days.

Lightweight aggregate shall conform to the requirements in ASTM Designation: C 330, and the following requirements:

- A. Lightweight aggregates shall be rotary kiln expanded shale, clay or slate. The coarse aggregate size shall not exceed 19 mm.
- B. The splitting tensile strength and the drying shrinkage requirements of ASTM Designation: C 330 shall not apply.

- C. Lightweight aggregates shall have not more than 5 percent loss when tested for soundness in conformance with the requirements in California Test 214.
- D. Natural sand and manufactured sand fine aggregates shall conform to the provisions in Section 90, "Portland Cement Concrete," of the Standard Specifications.
- E. The lightweight aggregate manufacturer shall have an established and documented quality control program. Documentation of the quality control program shall be submitted as a part of the Contractor's "Lightweight Concrete Quality Control Plan."

The dry, loose unit weight of coarse aggregates shall be between 800 and 880 kg per cubic meter.

Proportioning of lightweight concrete shall conform to the provisions in Section 90-5, "Proportioning," of the Standard Specifications and to these special provisions.

All lightweight concrete shall have good workability and other properties such that proper placement, consolidation, and finishing are obtained.

The aggregates shall be uniformly pre-wetted or presaturated in such a manner that uniform penetration of the concrete will be maintained. For lightweight aggregate, the following minimum pre-wetting or presaturation procedures shall be followed:

The lightweight aggregate shall be uniformly sprinkled with water, either by continuous or intermittent methods for seven days in advance of concrete placement. The occurrence of a steady rain of comparable intensity may permit temporary discontinuance of the sprinkler program at the direction of the Engineer, until the cessation of the rain. Water sprinkling shall be discontinued for 12 hours preceding the incorporation of the lightweight aggregate into the respective mix. However, the stockpile shall be monitored, and when necessary top-dressed to maintain the surface zone moisture content consistent with the material beneath the surface zone. Lightweight aggregate shall be used in a uniform damp condition. Where practical, the entire inventory shall be stockpiled and conditioned before the initial placement to promote uniformity. If after 5 days of water conditioning, the Contractor can demonstrate to the Engineer, that the lightweight aggregate exhibits an internal moisture of at least 15 percent, the seven day conditioning period may be reduced accordingly.

Portland cement, aggregates, water, and admixtures shall be proportioned to produce lightweight concrete containing not less than 350 kg nor more than 550 kg of cement per cubic meter, except that concrete used in roadway deck slabs and slab spans for highway bridges shall contain not less than 400 kg per cubic meter. The penetration requirements in Section 90-6.06, "Amount of Water and Penetration," of the Standard Specifications shall not apply to lightweight portland cement concrete. Penetration shall in accordance with the Contractor's approved mix design. The use of admixtures shall conform to the provisions in Section 90-4, "Admixtures," of the Standard Specifications, except that the Contractor may provide for a total air content of freshly mixed concrete of not more than 8.0 percent. The proportions shall be such that the concrete will meet or exceed the strength shown on the plans or specified in these special provisions.

The air content of the freshly mixed lightweight concrete will be determined in conformance with the requirements in ASTM Designation: C173.

Lightweight fine aggregate and natural sand shall be batched by mass. Lightweight coarse aggregate shall be batched either by mass or by volumetric methods. If volumetric methods are used, the batching equipment shall include provisions whereby the Engineer may check the mass of each size of aggregate in the batch.

Mixing and transporting lightweight concrete shall conform to the provisions in Section 90-6, "Mixing and Transporting," of the Standard Specifications and the following:

1. When lightweight concrete is pumped, the pump line shall be steel pipe at least 125mm in diameter without reducers.
2. The Contractor shall pay special attention to proper vibration techniques to avoid segregation of the concrete. Larger diameter vibrators operating at lower vibration amplitudes may be required to achieve proper vibration of lightweight concrete. A training class and practice vibration session for the Contractor's workers and for the State's Inspectors shall be held prior to placement of the first production lightweight concrete. The training class shall include actual practice vibrating using the approved superplasticized lightweight concrete mix and the type of vibrators proposed for use in production. Vibrating techniques shall be demonstrated on the test blocks and on the practice placement cubes.

The Contractor's attention is directed to the need to determine proper mixing techniques for lightweight concrete so that a uniform non-segregated mix can be obtained. The use of "slurry mixers" where the sand, water and cement are mixed first and then the coarse aggregate is added, is encouraged but not required.

Lightweight concrete shall be placed, finished, cured, and protected in conformance with the provisions in Section 51, "Concrete Structures," and Section 90, "Portland Cement Concrete," of the Standard Specifications.

Each trial batch shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications. The quantities of trial batch lightweight concrete will not be included in any contract item of work, and full compensation for furnishing, producing, and disposing of trial batches shall be considered as included in the contract price paid for the item of lightweight concrete involved, and no additional compensation will be allowed therefor.

Testing Lightweight Concrete

Lightweight concrete testing shall be performed by the Contractor's independent test laboratory. All certified test results shall be furnished to the Engineer within one week from the time of the performance of each test. The laboratory shall be ACI certified and approved by the Engineer. In addition to the requirements of Section 90-9, "Compressive Strength," of the Standard Specifications, lightweight concrete for the superstructure shall have the following additional testing performed by the Contractor's independent testing laboratory:

For each lightweight concrete cylinder taken for strength testing, the wet unit weight shall be reported. Wet unit weight shall be determined in accordance with ASTM C 567.

For each set of lightweight concrete cylinders taken for strength testing, three additional companion cylinders shall be taken to determine the air-dry unit weight of the lightweight concrete. Testing of two of the cylinders shall be in accordance with ASTM C 567, except that the cylinders shall be dried for additional time and the dry unit weight reported at 28, 60 and 90 days for each cylinder. The third cylinder shall be tested in accordance with Section 9, "Calculations and Reporting for Rapid Information," of ASTM C 567.

Three samples taken from the first segment of each cantilever shall be tested for modulus of elasticity in accordance with ASTM C 469-94, "Standard Test Method for Static Modulus of Elasticity and Poisson's Ratio of Concrete in Compression." The results shall be reported as an average of the three samples. Samples shall be moist cured for 3 days and then tested to determine 3 day results.

Two samples taken from the first segment of each cantilever shall be tested for creep in accordance with ASTM C 512-87 (Reapproved 1997), "Standard Test Method for Creep of Concrete in Compression." Creep data shall be presented both as specific creep (creep strain/applied creep load) and creep coefficient (creep deformation as a ratio to initial elastic deformation). The test cylinders shall be loaded at 28 days to a stress of 20 to 40% of the 28-day design compressive strength shown on the plans. Coefficients after 28, 56 and 90 days of loading shall be submitted and used to predict the coefficient at 365 days based on the procedures of CEB-FIP Model Code for Concrete Structures, by the Comite Euro-International de Beton.

Samples taken from the first segment of each cantilever shall be tested for shrinkage in accordance with ASTM C 157. Sample size shall be 100x100x285 mm. The samples shall be moist cured for 7 days followed by air drying at 23°C and 50% relative humidity.

Three full size 150 x 300 mm and three 102 x 203 mm reserve cylinders shall be taken for each segment placed. The cylinders shall be stored at the bridge site and shall be kept for the duration of the project. Cylinders shall be stripped from their molds when formwork at the corresponding segment is stripped. Thereafter specimens shall be stored on site protected from direct rain and sunlight. Each cylinder shall be clearly identified as to segment number and date cast using permanent markers and they shall be stored in such a way that specific cylinders are easily retrievable. At the completion of the project any cylinders not requested by the Engineer shall become the property of the Contractor and shall be removed and disposed of as provided in Section 7-1.13, "Disposal of Material Outside the Right of Way," of the Standard Specifications.

Should the results of any modulus, creep or shrinkage test not satisfy the specified mix design requirements for two consecutive tests, all work involving lightweight concrete shall cease until the problem is identified and resolved to the satisfaction of the Engineer. For concrete already in place with failed test results, the Contractor shall propose remedial measures or shall remove the concrete represented by the failed tests. All costs associated with corrections to the lightweight concrete mix design, and or any remedial measures or removal shall be borne by the Contractor.

Should the results of any single air-dry unit mass test (based on sample cylinders) not satisfy the specified mix design requirements but be not be more than 30 kg per cubic meter above the design air-dry unit mass, the Contractor shall, at the Contractor's expense, make corrective changes, subject to approval of the Engineer, in the mix proportions or in the concrete fabrication procedures before placing additional concrete, and shall pay to the State \$50.00 for each structurally adequate in-place cubic meter of concrete represented by the deficient test. If the result of any single air-dry unit weight test (based on sample cylinders) is more than 30 kilograms but less than 60 kilograms above the specified air-dry unit mass, the Contractor shall make the corrective changes specified above, and shall pay to the State \$100.00 for each structurally adequate in-place cubic meter of concrete represented by the deficient test. All concrete represented by a single test (based on sample cylinders) which indicates an air-dry unit mass above 1982 kilograms per cubic meter will be rejected in accordance with the provisions in Section 6-1.04, "Defective Materials."

If the sample cylinder test results indicate an air-dry unit mass greater than 1922 kilograms per cubic meter, payments to the State as required above shall be made, unless the Contractor, at the Contractor's expense, obtains and submits evidence acceptable to the Engineer that the air-dry unit mass of the concrete placed in the work is less than the maximum specified air-dry unit mass. If the evidence consists of tests made on cores taken from the work, the cores shall be obtained and tested in accordance with the specifications of ASTM Designation: C 42.

Lightweight Concrete Quality Control Plan

Prior to placing any lightweight concrete on the project, the Contractor, in coordination with the lightweight concrete supplier (and his supplier of the lightweight aggregate), shall submit to the Engineer the manufacturer's lightweight concrete quality control plan for review and approval. The plans shall address all aspects of the lightweight concrete production from transportation of the aggregates to mixing and transportation of the lightweight concrete. The plan shall be developed to maintain consistent lightweight concrete properties and workability under various environmental conditions and shall include flowcharts showing the procedure for adjusting the mix design should properties not meet those required in these special provisions.

The manufacturer's Quality Control Manual (QCM) for the production of lightweight concrete shall include the following:

- 1) The pre-production procedures for the qualification of materials and equipment; including requirements for testing and reporting of lightweight aggregate gradation, dry unit weight and wet unit weight both before and after transporting from the manufacturing facility;
- 2) The methods and frequencies for performing all quality control procedures during production; including the daily sampling procedures for determining the wet unit weight of the lightweight aggregates in the lightweight aggregate stockpiles;
- 3) The calibration procedures and calibration frequency for all equipment;
- 4) A system for the identification and tracking of placements of lightweight concrete. The system shall have provisions for identifying the location of the concrete in the structure of represented by each set of samples taken.
- 5) An outline of the daily production log for the production of lightweight concrete shall be kept by the manufacturer for each day of production. The log shall clearly indicate the cement and additive lot numbers, the aggregate sources, the batch ticket numbers, the ticket numbers of the batches where samples were taken, including tracking of all tests and results of all tests performed.

The quality control plan shall be submitted to the Resident Engineer's Office, for approval in accordance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. For initial review, 5 sets of drawings and calculations shall be submitted. After review, between 6 and 12 sets, as requested by the Engineer, shall be submitted for final approval and use during construction.

Lightweight Concrete Preplacement Conference

At least two weeks prior to the placement of the first lightweight concrete on the project, a mandatory preplacement conference shall be held with the Contractor, the lightweight concrete supplier, the Contractor's Independent Testing Laboratory, the Engineer, the State's inspectors and any other parties involved with the lightweight concrete for the project. The Contractor shall present his plans for furnishing, placing, sampling and testing of the lightweight concrete in accordance with the requirements of these special provisions. The preplacement conference shall be followed with a practice placement as outlined herein. At the conclusion of the practice placement, the group shall meet again and discuss the results of the practice placement. The Contractor shall make changes to his procedures (documented in writing) for any problems noted by the Engineer during the practice placement prior to placing any lightweight concrete in the superstructure.

Practice Placement

The Contractor shall demonstrate his capability to deliver and place lightweight concrete in accordance with these special provisions prior to placing any permanent lightweight concrete into the bridge superstructure. Practice placement of lightweight concrete shall utilize the same delivery and placing equipment as shall be used in the actual work and shall use the same mix as approved by the Engineer. As a minimum, two one cubic meter lightweight concrete cubes shall be cast. The cubes shall have bar reinforcing in them with a similar density to the most dense reinforcing in the lightweight concrete areas with covers matching those shown on the plans for the girder webs and soffit. The cubes shall be located at the top of the first pier table where the first segmental construction is to begin.

If lightweight concrete is to be pumped, the air content, penetration, and unit mass shall be measured before and after pumping of the practice lightweight concrete placement. Twelve sample cylinders shall be taken for each cube cast: six before pumping and six after pumping. The lightweight concrete penetration as sampled after pumping or transporting to the top of the pier shall conform to the Contractor's approved lightweight concrete mix design. The compressive strength at 3

and 7 days, based on an average of 3 breaks, shall be reported to the Engineer for approval. Pumping of lightweight concrete for the actual superstructure shall not be allowed until the Engineer approves the pumping procedure, equipment and compressive strength results of the practice placement.

The sample cubes shall be stripped and inspected for rock pockets and lightweight aggregate segregation. If the Engineers reject the practice cubes, placement procedures or strength results, the Contractor shall repeat the practice placement, at the Contractor's expense, until acceptable results are obtained. The sample cubes shall become the property of the Contractor and shall be removed and disposed of as provided in Section 7-1.13, "Disposal of Material Outside the Right of Way," of the Standard Specifications.

FALSEWORK

Falsework shall be designed and constructed in conformance with the requirements in Section 51-1.06, "Falsework," of the Standard Specifications and these special provisions.

Section 51-1.06A, "Falsework Design and Drawings," of the Standard Specifications is amended to read:

51-1.06A Falsework Design and Drawings

- The Contractor shall submit to the Engineer working drawings and design calculations for falsework proposed for use at bridges. For bridges where the height of any portion of the falsework, as measured from the ground line to the soffit of the superstructure, exceeds 4.25 m; or where any individual falsework clear span length exceeds 4.85 m; or where provision for vehicular, pedestrian, or railroad traffic through the falsework is made; the drawings shall be signed by an engineer who is registered as a Civil Engineer in the State of California. Six sets of the working drawings and 2 copies of the design calculations shall be furnished. Additional working drawings and design calculations shall be submitted to the Engineer when specified in "Railroad Relations and Insurance" of the special provisions.
- The falsework drawings shall include details of the falsework erection and removal operations showing the methods and sequences of erection and removal and the equipment to be used. The details of the falsework erection and removal operations shall demonstrate the stability of all or any portions of the falsework during all stages of the erection and removal operations.
- Attention is directed to Section 5-1.02, "Plans and Working Drawings."
- For falsework over railroads, approval by the Engineer of the falsework drawings will be contingent upon the drawings being satisfactory to the railroad company involved.
- Except for placement of foundation pads and piles, the construction of any unit of falsework shall not start until the Engineer has reviewed and approved the drawings for that unit.
- Except as otherwise provided in the special provisions, the Contractor shall allow 3 weeks after complete drawings and all support data are submitted, for the review of any falsework plan.
- In the event that several falsework plans are submitted simultaneously, or an additional plan is submitted for review before the review of a previously submitted plan has been completed, the Contractor shall designate the sequence in which the plans are to be reviewed. In such event, the time to be provided for the review of any plan in the sequence shall be not less than the review time specified above for that plan, plus 2 weeks for each plan of higher priority which is still under review. A falsework plan submittal shall consist of plans for a single bridge, or portion thereof, or a single frame of a multi-frame bridge.
- Should the Engineer fail to complete the review within the time allowance, and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in falsework plan review, the delay will be considered a right of way delay as specified in Section 8-1.09, "Right of Way Delays."
- The Contractor may revise approved falsework drawings provided sufficient time is allowed for the Engineer's review and approval before construction is started on the revised portions. The additional time will not be more than that which was originally allowed.
- If structural composite lumber is proposed for use, the falsework drawings shall clearly identify the structural composite lumber members by grade (E value), species, and type. The Contractor shall provide technical data from the manufacturer showing the tabulated working stress values of the composite lumber. The Contractor shall furnish a certificate of compliance as specified in Section 6-1.07, "Certificates of Compliance," for each delivery of structural composite lumber to the project site.
- The falsework drawings shall include a superstructure placing diagram showing the concrete placing sequence and construction joint locations. When a schedule for placing concrete is shown on the contract plans, no deviation will be permitted.
- The maximum length of falsework spans used to support T-beam girder bridges shall not exceed 4.3 m plus 8.5 times the depth of the T-beam girder.
- When footing type foundations are to be used, the Contractor shall determine the bearing value of the soil and shall show the values assumed in the design of the falsework on the falsework drawings.

- When pile type foundations are to be used, the falsework drawings shall show the maximum horizontal distance that the top of a falsework pile may be pulled in order to position the falsework pile under its cap. The falsework plans shall also show the maximum allowed deviation of the top of the pile, in its final position, from a vertical line through the point of fixity of the pile.
- For falsework piles with a calculated loading capacity greater than 900 kN, the falsework piles shall be designed by an engineer who is registered as either a Civil Engineer or a Geotechnical Engineer in the State of California, and the calculations shall be submitted to the Engineer.
- Anticipated total settlements of falsework and forms shall be shown on the falsework drawings. These should include falsework footing settlement and joint take-up. Anticipated settlements shall not exceed 25 mm. Falsework supporting deck slabs and overhangs on girder bridges shall be designed so that there will be no differential settlement between the girders and the deck forms during placement of deck concrete.
- Falsework footings shall be designed to carry the load imposed upon the footings without exceeding the estimated soil bearing values and anticipated settlements.
- Foundations for individual steel towers where the maximum leg load exceeds 130 kN shall be designed and constructed to provide uniform settlement under all legs of each tower under all loading conditions.
- The support systems for form panels supporting concrete deck slabs and overhangs on girder bridges shall also be considered to be falsework and designed as such.
- Temporary bracing shall be provided, as necessary, to withstand all imposed loads during erection, construction, and removal of any falsework. The falsework drawings shall show provisions for the temporary bracing, or methods to be used to conform to this requirement during each phase of erection and removal. Wind loads shall be included in the design of the bracing or methods.
- The falsework design calculations shall show the stresses and deflections in load supporting members.
- The design of falsework will not be approved unless it is based on the use of loads and conditions which are no less severe than those described in Section 51-1.06A(1), "Design Loads," and based on the use of stresses and deflections which are no greater than those described in Section 51-1.06A(2), "Design Stresses, Loadings, and Deflections." The Contractor is responsible for the proper evaluation of the falsework materials and design of the falsework to safely carry the actual loads imposed.

Section 51-1.06A(1), "Design Loads," of the Standard Specifications is amended to read:

51-1.06A(1) Design Loads

- The design load for falsework shall consist of the sum of dead and live vertical loads, and an assumed horizontal load. The minimum total design load for any falsework, including members that support walkways, shall be not less than 4800 N/m^2 for the combined live and dead load regardless of slab thickness.
- Dead loads shall include the loads due to the mass of concrete, reinforcing steel, forms, and falsework. The loads due to the mass of concrete, reinforcing steel, and forms shall be assumed to be not less than 25 kN/m^3 for normal concrete and not less than 20 kN/m^3 for lightweight concrete.
- Live loads shall consist of the actual load of any equipment to be supported by falsework applied as concentrated loads at the points of contact, and a uniform load of not less than 960 N/m^2 applied over the area supported, plus 1100 N/m applied at the outside edge of deck overhangs.
- The assumed horizontal load to be resisted by the falsework bracing system shall be the sum of the actual horizontal loads due to equipment, construction sequence, or other causes, and an allowance for wind, but in no case shall the assumed horizontal load to be resisted in any direction be less than 2 percent of the total dead load. The falsework shall be designed so that it will have sufficient rigidity to resist the assumed horizontal load without considering the load due to the concrete.
- The minimum horizontal load to be allowed for wind on heavy-duty steel shoring or steel pipe column falsework having a vertical load carrying capacity exceeding 130 kN per leg or column shall be the sum of the products of the wind impact area, shape factor, and applicable wind pressure value for each height zone. The wind impact area is the total projected area of all the elements in the tower face or falsework bent normal to the direction of the applied wind. The shape factor shall be taken as 2.2 for heavy-duty shoring and 1.0 for pipe column falsework. Wind pressure values shall be determined from the following table:

Height Zone (Meters above ground)	Wind Pressure Value (Pa)	
	Shores or Columns Adjacent to Traffic	At Other Locations
0-9	960	720
9-15	1200	960
15-30	1440	1200
over 30	1675	1440

- The minimum horizontal load to be allowed for wind on all other types of falsework, including falsework supported on heavy-duty shoring or pipe column falsework, shall be the sum of the products of the wind impact area and applicable wind pressure value for each height zone. The wind impact area is the gross projected area of the falsework and any unrestrained portion of the permanent structure, excluding the areas between falsework bents or towers where diagonal bracing is not used. Wind pressure values shall be determined from the following table:

Height Zone (Meters above ground)	Wind Pressure Value (Pa)	
	For Members Over and Bents Adjacent to Traffic Opening	At Other Locations
0 to 9	2.0 Q	1.5 Q
9 to 15	2.5 Q	2.0 Q
15 to 30	3.0 Q	2.5 Q
Over 30	3.5 Q	3.0 Q

$Q = 48 + 31.4 W$; but shall not be more than 479 Pa.

W = width of the falsework system, in meters, measured in the direction of the wind force being considered.

- The entire superstructure cross-section, except railing, shall be considered to be placed at one time except as provided herein. Girder stems and connected bottom slabs, if placed more than 5 days prior to the top slab, may be considered to be self supporting between falsework posts at the time the top slab is placed provided that the distance between falsework posts does not exceed 4 times the depth of the portion of the girder placed in the first pour.
- In addition to the minimum requirements specified in this Section 51-1.06A, falsework for box girder structures with internal falsework bracing systems using flexible members capable of withstanding tensile forces only, shall be designed to include the vertical effects caused by the elongation of the flexible member and the design horizontal load combined with the dead and live loads imposed by concrete placement for the girder stems and connected bottom slabs. Falsework comprised of individual steel towers with bracing systems using flexible members capable of withstanding tensile forces only to resist overturning, shall be exempt from these additional requirements.
- If the concrete is to be prestressed, the falsework shall be designed to support any increased or readjusted loads caused by the prestressing forces.

Section 51-1.06A(2), "Design Stresses, Loadings, and Deflections," of the Standard Specifications is amended to read:

51-1.06A(2) Design Stresses, Loadings, and Deflections

- The maximum allowable design stresses and loadings listed in this Section 51-1.06A(2), are based on the use of undamaged, high-quality materials, and such stresses and loadings shall be reduced by the Contractor if lesser quality materials are to be used.
- The maximum allowable stresses, loadings, and deflections used in the design of the falsework shall be as follows:

Timber:

Compression perpendicular to the grain	3.1 MPa
Compression parallel to the grain	$3310 \div (L/d)^2$ MPa; not to exceed 11 MPa
Flexural stress	12.4 MPa; 10.3 MPa for members with a nominal depth of 205 mm or less
Horizontal shear	1.0 MPa
Axial tension	8.3 MPa
Deflection due to concrete loading only	0.0042 of the span, irrespective of deflection compensated for by camber strips
Modulus of elasticity (E)	11×10^3 MPa
Timber piles	400 kN

L = unsupported length (mm).

d = least dimension of a square or rectangular column, or the width of a square of equivalent cross-sectional area for round columns (mm).

- Timber connections shall be designed in conformance with the procedures, stresses, and loads permitted in the Falsework Manual as published by the Department of Transportation.

Steel

- For identified grades of steel, design stresses, except stresses due to flexural compression, shall not exceed those specified in the Manual of Steel Construction as published by the AISC.
- When the grade of steel cannot be positively identified, design stresses, except stresses due to flexural compression, shall not exceed either those specified in the AISC Manual for ASTM Designation: A 36/A 36M steel or the following:

Tension, axial and flexural	152 MPa
Compression, axial	$110\,300 - 2.62(L/r)^2$ kPa; except L/r shall not exceed 120
Shear on gross section of web of rolled shapes	100 MPa
Web crippling for rolled shapes	186 MPa

- For all grades of steel, design stresses and deflections shall not exceed the following:

Compression, flexural	83 000 MPa, but not to exceed 152 MPa for unidentified steel or steel conforming to the requirements in ASTM Designation: A 36/A 36M nor $0.6F_y$ for other identified steel
	Ld/bt
Deflection due to concrete loading only	0.0042 of the span, irrespective of deflection compensated for by camber strips

- In the foregoing formulas, L is the unsupported length; d is the least dimension of rectangular columns, or the width of a square of equivalent cross-sectional area for round columns, or the depth of beams; b is the width and t is the thickness of the compression flange; and r is the radius of gyration of the member. All dimensions are expressed in millimeters. F_y is the specified minimum yield stress, in MPa, for the grade of steel used.
- The modulus of elasticity (E) used for steel shall be 20.7×10^4 MPa.

Manufactured Assemblies

- The maximum loadings and deflections used on jacks, brackets, columns, joists, and other manufactured devices shall not exceed the manufacturer's recommendations except that the dead load deflection of the joists used at locations other than under deck slabs between girders shall not exceed 0.0042 of their spans. If requested by the

Engineer, the Contractor shall furnish engineering data from the manufacturer verifying the manufacturer's recommendations, or shall perform tests as necessary to demonstrate the adequacy of the devices proposed for use.

Welding and Nondestructive Testing

Welding of steel members, except for when fillet welds are used where load demands are less than or equal to 175 N/mm for each 3 mm of fillet weld, shall conform to AWS D1.1 or other recognized welding standard. The welding standard to be utilized shall be specified by the Contractor on the working drawings.

Splices made by field welding of steel beams at the project site shall undergo nondestructive testing (NDT). At the option of the Contractor, either ultrasonic testing (UT) or radiographic testing (RT) shall be used as the method of NDT for each field weld and any repair made to a previously welded splice in a steel beam. Testing shall be performed at locations selected by the Contractor. The length of a splice weld where NDT is to be performed, shall be a cumulative weld length equal to 25 percent of the original splice weld length. The cover pass shall be ground smooth at the locations to be tested. The acceptance criteria shall conform to the requirements of AWS D1.1, Section 6, for cyclically loaded nontubular connections subject to tensile stress. If repairs are required in a portion of the weld, additional NDT shall be performed on the repaired sections. The NDT method chosen shall be used for an entire splice evaluation including any required repairs.

For all field welded splices and previously welded splices, the Contractor shall furnish to the Engineer a letter of certification which certifies that all welding and NDT, including visual inspection, are in conformance with the specifications and the welding standard shown on the approved working drawings. The letter of certification shall be signed by an engineer who is registered as a Civil Engineer in the State of California and shall be provided prior to placing any concrete for which the falsework is being erected to support.

Section 51-1.06A(3), "Special Locations," of the Standard Specifications is amended to read:

51-1.06A(3) Special Locations

- In addition to the minimum requirements specified in this Section 51-1.06A, falsework over or adjacent to roadways or railroads which are open to traffic shall be designed and constructed so that the falsework will be stable if subjected to impact by vehicles. Falsework posts which support members that cross over a roadway or railroad shall be considered as adjacent to roadways or railroads. Other falsework posts shall be considered as adjacent to roadways or railroads only if they are located in the row of falsework posts nearest to the roadway or railroad, and the horizontal distance from the traffic side of the falsework to the edge of pavement, or to a point 3 m from the centerline of track, is less than the total height of the falsework and forms. The Contractor shall provide any additional features for the work needed to ensure that falsework will be stable if subjected to impact by vehicles and to comply with the provisions in Section 7-1.09, "Public Safety." The falsework design at these locations shall include, but not be limited to, the following minimum provisions:

The vertical load used for the design of falsework posts and towers, but not footings, which support the portion of the falsework over openings, shall be the greater of the following:

- (1) 150 percent of the design load calculated in conformance with the provisions for design load previously specified but not including any increased or readjusted loads caused by the prestressing forces, or
- (2) the increased or readjusted loads caused by the prestressing forces.

Falsework posts adjacent to roadways or railroads shall consist of either steel with a minimum section modulus about each axis of $156 \times 10^3 \text{ mm}^3$, or sound timbers with a minimum section modulus about each axis of $4.1 \times 10^6 \text{ mm}^3$.

Each falsework post adjacent to roadways or railroads shall be mechanically connected to its supporting footing at its base, or otherwise laterally restrained, so as to withstand a force of not less than 9 kN applied at the base of the post in any direction except toward the roadway or railroad track. The posts also shall be mechanically connected to the falsework cap or stringer. The mechanical connection shall be capable of resisting a load in any horizontal direction of not less than 4.5 kN.

For falsework spans over roadways, all exterior falsework stringers, and stringers adjacent to the ends of discontinuous caps, the stringer or stringers over points of minimum vertical clearance and every fifth remaining stringer, shall be mechanically connected to the falsework cap or framing. The mechanical connections shall be capable of resisting a load in any direction, including uplift on the stringer, of not less than 2.2 kN. The connections shall be installed before traffic is allowed to pass beneath the span. For falsework spans over railroads, all falsework stringers shall be so connected to caps.

When timber members are used to brace falsework bents which are located adjacent to roadways or railroads, all connections for the timber bracing shall be of the bolted type using 16-mm diameter or larger bolts.

The falsework shall be located so that falsework footings or piles are at least 75 mm clear of railing posts and barriers, and all other falsework members are at least 0.3-m clear of railing members and barriers.

Falsework bents within 6 m of the center line of a railroad track shall be sheathed solid in the area between 1 m and 5 m above the track elevation on the side facing the track. Sheathing shall consist of plywood not less than 16-mm thick or lumber not less than 19-mm thick. Bracing on these bents shall be adequate so that the bent will resist the required assumed horizontal load or 22 kN, whichever is greater.

The dimensions of the clear openings to be provided through falsework for roadways shall be as specified in "Maintaining Traffic," of the special provisions.

The dimensions of clear openings to be provided through the falsework for railroads shall be as specified in "Railroad Relations and Insurance," of the special provisions.

Section 51-1.06B, "Falsework Construction," of the Standard Specifications is amended to read:

51-1.06B Falsework Construction

- The falsework shall be constructed to substantially conform to the falsework drawings. The materials used in the falsework construction shall be of the quality necessary to sustain the stresses required by the falsework design. When manufactured assemblies are used in falsework, the Contractor shall furnish to the Engineer a letter of certification which certifies that all components of these manufactured assemblies are used in conformance with the manufacturer's recommendations. The workmanship used in falsework construction shall be of such quality that the falsework will support the loads imposed on the falsework without excessive settlement or take-up beyond that shown on the falsework drawings.
- Falsework shall be founded on a solid footing safe against undermining, protected from softening, and capable of supporting the loads imposed on the falsework. When requested by the Engineer, the Contractor shall demonstrate by suitable load tests that the soil bearing values assumed for the design of the falsework do not exceed the supporting capacity of the soil.
- When falsework is supported on piles, the piles shall be driven and the actual bearing value assessed in conformance with the provisions in Section 49, "Piling."
- For falsework piles with a calculated loading capacity greater than 900 kN, the Contractor shall conduct dynamic monitoring of pile driving and conduct penetration and bearing analyses based on a wave equation analysis. These analyses shall be signed by an engineer who is registered as a Civil Engineer in the State of California and submitted to the Engineer prior to completion of falsework erection.
- When falsework is over or adjacent to roadways or railroads, all details of the falsework system which contribute to horizontal stability and resistance to impact, except for bolts in bracing, shall be installed at the time each element of the falsework is erected and shall remain in place until the falsework is removed.
- Prior to the placement of falsework members above the stringers, the final bracing system for the falsework shall be installed.
- Temporary railing (Type K), conforming to the provisions in Section 12-3, "Traffic-Handling Equipment and Devices," shall be installed on both sides of all vehicular openings through falsework and, when ordered by the Engineer, at all other falsework less than 3.6 m from the edge of a traffic lane. Temporary railings shall begin approximately 46 m in advance of the falsework and shall extend past the falsework, in the direction of adjacent traffic flow. For 2-way traffic openings, the temporary railing shall extend at least 18 m past the falsework, in the direction of adjacent traffic flow. The location and length of railing and the type of flare to be used shall be as ordered by the Engineer. The clear vehicular opening between temporary railings shall be not less than that specified in the special provisions.
- The installation of temporary railing shall be complete before falsework erection is begun. Temporary railing at falsework shall not be removed until the removal is approved by the Engineer.
- Temporary railing (Type K) installed as specified above will be measured and paid for as provided in Section 12-4, "Measurement and Payment," except that when the Engineer's Estimate does not include a contract item for temporary railing (Type K), full compensation for furnishing, placing, maintaining, repairing, replacing, and removing the temporary railing at falsework locations as specified in this Section 51-1.06B, shall be considered as included in the contract prices paid for the various items of work requiring falsework, and no separate payment will be made therefor.
- Camber strips shall be used where directed by the Engineer to compensate for falsework deflection, vertical alignment, and anticipated structure deflection. The Engineer will furnish to the Contractor the amount of camber to be used in constructing the falsework.

- The Contractor shall provide tell-tales attached to the soffit forms and readable from the ground in enough systematically placed locations to determine the total settlement of the entire portion of the structure where concrete is being placed.
- Deck slab forms between girders shall be constructed with no allowance for settlement relative to the girders.
- Dead loads, other than those due to forms and reinforcing steel, shall not be applied to any falsework until authorized by the Engineer.
- Should unanticipated events occur, including settlements that deviate by more than ± 10 mm from those indicated on the falsework drawings, which in the opinion of the Engineer would prevent obtaining a structure conforming to the requirements of these specifications, the placing of concrete shall be discontinued until corrective measures satisfactory to the Engineer are provided. In the event satisfactory measures are not provided prior to initial set of the concrete in the affected area, the placing of concrete shall be discontinued at a location determined by the Engineer. All unacceptable concrete shall be removed.

Section 51-1.06C, "Removing Falsework," of the Standard Specifications is amended to read:

51-1.06C Removing Falsework

- Falsework supporting any span of a simple span bridge shall not be released before 10 days after the last concrete, excluding concrete above the bridge deck, has been placed. Unless otherwise permitted by the Engineer, falsework supporting any span of a continuous or rigid frame bridge shall not be released before 10 days after the last concrete, excluding concrete above the bridge deck, has been placed in that span and in the adjacent portions of each adjoining span for a length equal to at least one-half the length of the span where falsework is to be released.
- Falsework for cast-in-place prestressed portions of structures shall not be released until after the prestressing steel has been tensioned.
- Falsework supporting any span of a continuous or rigid frame bridge shall not be removed until all required prestressing has been completed in that span and in the adjacent portions of each adjoining span for a length equal to at least one-half the length of the span where falsework is to be released.
- Falsework for arch bridges shall be removed uniformly and gradually, beginning at the crown and working toward the springing, to permit the arch to take its load slowly and evenly. Falsework for adjacent arch spans shall be struck simultaneously.
- Falsework supporting overhangs, deck slabs between girders, and girder stems which slope 45 degrees or more off vertical shall not be released before 7 days after the deck concrete has been placed.
- Falsework supporting the sides of the girder stems which slope less than 45 degrees off vertical may be removed prior to placing deck slab concrete, providing a reshoring system is installed. The reshoring system shall consist of lateral supports which are designed to resist all rotational forces acting on the stem, including those caused by the placement of deck slab concrete. The lateral supports shall be installed immediately after each form panel is removed and prior to the release of supports for the adjacent form panel.
- Falsework for bent caps which will support steel or precast concrete girders shall not be released before 7 days after the cap concrete has been placed. Girders shall not be erected onto the bent caps until the concrete in the cap has attained a compressive strength of 18 MPa or 80 percent of the specified strength, whichever is higher.
- Unless otherwise specified, removing falsework supporting any span of structural members subject to bending, shall conform to the requirements for removing falsework supporting any span of a simple span bridge.
- In addition to the above requirements, no falsework for bridge spans shall be released until the supported concrete has attained a compressive strength of 18 MPa or 80 percent of the specified strength, whichever is higher.
- Falsework for box culverts and other structures with decks lower than the roadway pavement and with span lengths of 4.25 m or less shall not be released until the last placed concrete has attained a compressive strength of 11 MPa, provided that curing of the concrete is not interrupted. Falsework removal for other box culverts shall conform to the requirements for release of bridge falsework.
- Falsework for arch culverts shall not be released before 40 hours after the supported concrete has been placed.
- The falsework removal operation shall be conducted in such a manner that any portion of the falsework not yet removed remains in a stable condition at all times.
- All falsework materials shall be completely removed. Falsework piling shall be removed at least 0.6-m below the surface of the original ground or original streambed. When falsework piling is driven within the limits of ditch or channel excavation areas, the falsework piling within those areas shall be removed to at least 0.6-m below the bottom and side slopes of the excavated areas.
- All debris and refuse resulting from the work shall be removed and the premises left in a neat and presentable condition.

In addition to the provisions in Section 51-1.06A, "Falsework Design and Drawings," of the Standard Specifications, the time to be provided for the Engineer's review of the working drawings for specific structures, or portions thereof, shall be as follows:

Structure or Portion of Structure	Total Review Time - Weeks
Portion of Frame 1 to be cast on falsework(from contract beginning to middle of Span 15)	6
Frame 4	6

The Contractor's falsework may not be supported within the Rhodia Treatment Plant Property limits. However, stringers and cap beams may protrude into the air space above the property provided 1.0 meters of vertical clearance is obtained above these facilities. Falsework near this facility shall conform to the details shown on the plans.

The Contractor's attention is directed to the existing Rhodia water sampling wells in the vicinity of Pier 4. The Contractor's falsework supports shall not be placed within a 3 meter radius of any wells. In addition, access to these wells shall be provided at all times should sampling need to be performed.

Falsework for the pier footings may be supported from the top of the piles (2.5 m permanent steel casings). Falsework shall not be supported by welding or bolting connections to the permanent steel casings below the bottom of footing. Circular clamp-on collar supports which are not permanently attached to the permanent steel casings, may be used below the bottom of footing elevation to support falsework. Falsework and supports shall be sufficiently rigid to support the full weight of falsework, footing Stage 1 concrete, "starter" pier reinforcing steel cage, and construction live load acting on the footing. The falsework shall be such that there is no measurable vertical displacement between any piling and the footing since such displacement could damage the integrity of the grouted joint between the piles and steel ring sleeves.

The Contractor's attention is directed to the permits the State has obtained for construction this project. Falsework shall meet all the requirements of these permits.

SEGMENTALLY ERECTED SUPERSTRUCTURE

Portions of the bridge superstructure, as shown on the plans, shall be constructed using cast-in-place cantilevered segmental construction with form travelers. Cast-in-place segmental construction shall conform to the requirements in these special provisions.

Definitions.-- The following definitions shall apply to segmental bridge construction:

1. Segment: refers to a unit of the superstructure that is cast between two vertical construction joints. The cross section and length of the segments are detailed on the Plans.
2. Pier Table: refers to a segment located directly on top of the pier.
3. Balanced Cantilever Construction: is a method by which the segments are sequentially cast alternately on either side of a pier in cantilever to a point where a closure is cast-in-place or a hinge is constructed.
4. Form traveler: is a movable form truss used to support the formwork and cast the concrete of the segments.
5. Camber: is the vertical dimension added or subtracted to the geometric profile grade that shall be set at the time of casting a new segment, or to counter the deformations of the superstructure at different construction stages to control the construction geometry to achieve the theoretical profile after the final deformations have taken place, including residual camber. The determination of camber values and erection elevations are dependent upon the Contractor's erection sequence, schedule, construction loads, prestressing scheme and achieving the material properties as specified.

Contractor's Personnel.--

The Contractor shall provide the various professional engineering functions in order to effectively carry out the responsibilities assigned to him by requirements contained in these special provisions including providing technician level functions in conjunction with geometry control activities during casting of segments on the bridge. The Contractor's personnel shall conform to the following:

Contractor's Engineer- The Contractor's Engineer shall be a professional engineer registered in the State of California who has specific knowledge of and experience in the design and construction of concrete segmental bridges erected using balanced cantilever techniques. This may be a professional engineer who is an employee of the Contractor or a consulting engineering firm under contract to the Contractor. The Contractor may utilize more than one person or firm to provide these services.

The Contractor's Engineer shall be responsible for carrying out all engineering services required to construct the bridge in accordance with the plans and specifications. He shall also be responsible for the monitoring of any engineering services developed by him during construction of the bridge. The Contractor's engineer shall be intimately familiar with the Contractor's Form Traveler Operation Manual, Geometry Control Manual, and Camber Control Manual.

The Contractor's Engineer shall witness and supervise important milestones in the work. As a minimum, the Contractor's Engineer shall witness and be present for the following items of work:

- a. During first time erection and first time moving of the form travelers.
- b. During in-place friction testing of tendons.
- c. During the construction of the first balanced cantilever until the travelers have been moved to another pier.
- d. During the start up of any critical operation such as post-tensioning and grouting of tendons.

The Contractor's Engineer shall be available on a one hour notice to discuss occurrences by telephone on any day when the following activities are underway at the job site:

- a. Casting of segments.
- b. Post-tensioning of tendons.
- c. Grouting of tendons.
- d. Each time the form traveler is moved.

Within 10 days after award of contract, the Contractor shall submit in accordance with Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications, evidence which establishes, to the satisfaction of the Engineer, that an employee or consulting engineering firm he proposes to designate as the Contractor's engineer has the qualifications set out herein. No work requiring involvement of the Contractor's engineer shall be started until the Engineer has reviewed this submittal, and responded with written acceptance of the proposed Contractor's engineer for this project. A written acceptance or denial of the proposed Contractor's engineer shall be provided by the State within 30 days of receiving the Contractor's submittal. Should the Contractor elect to utilize a different engineer or consulting engineering firm as the "Contractor's engineer" during the course of the work, the Contractor shall resubmit new qualifications for approval.

Geometry Control Technician(s).--The Contractor's personnel responsible for carrying out geometry control activities during casting superstructure segments shall possess the skills and prior experience in the specific type of work necessary to effectively control the final geometry of the bridge. The Contractor may utilize more than one person to provide these services.

The Contractor's geometry control technicians shall carry out all geometry control during casting of the segments. The Contractor's geometry control technicians shall be intimately familiar with the Contractor's Form Traveler Operation Manual, Geometry Control Manual, and Camber Control Manual.

Prior to beginning any work which requires superstructure geometry control measurements, the Contractor shall submit, in accordance with Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications, complete information establishing the control activities and qualifications of his/her geometry control technician(s). The minimum qualifications for a geometry control technician shall be: hands-on experience controlling geometry on three long span (greater than 120m span) cast-in-place balanced cantilever segmentally erected bridges. Only technicians whose qualifications have been approved by the Engineer shall be assigned to carry out geometry control activities. A written acceptance or denial of the proposed geometry control technician(s) shall be provided by the State within 30 days of receiving the Contractor's submittal. Should the Contractor elect to utilize a different person(s) as the "geometry control technician(s)" during the course of the work, the Contractor shall resubmit new qualifications for approval.

General

The form travelers shall be supported by previously erected portions of the superstructure, as shown on the plans.

Alternatives other than cast-in-place cantilevered segmental construction, for portions of the bridge shown to be segmentally constructed, will not be considered. Segment construction equipment and methods proposed for use by the Contractor shall be consistent with the concepts and erection sequence shown on the plans in order to ensure compatibility with the overall design. Any deviation from the construction concepts presented on the plans will require reanalysis (and redesign) to insure the structural adequacy of the bridge for construction, service and ultimate loadings. The Contractor's attention is also directed to the requirements for submitting cost reduction incentive proposals elsewhere in these special provisions.

The Contractor's attention is directed to "Prestressing Concrete" and "Lightweight Concrete" of these special provisions and to Section 51-1.11, "Construction Methods," of the Standard Specifications for additional materials and installation

requirements not included herein. The Contractor's attention is directed to "Progress Schedule (Critical Path)" for requirements on submitting the Contractor's proposed segmental construction sequence.

Contractor's Qualifications

The Contractor shall have at least five years experience in constructing multi-span cast-in-place prestressed concrete segmental bridges with form travelers, and the Contractor's full-time work site staff shall include a superintendent with responsible experience in the use of form travelers for cast-in-place construction. The Contractor shall submit a list of at least 2 previous projects constructed by the Contractor and the qualifications and experience of the proposed superintendent as part of the "Bridge Construction Information/Questionnaire" which is required to be submitted with the bid. The bidder's attention is directed to Section 2-1.06, "Bridge Construction Information/Questionnaire," and Section 3, "Pre-Award Meeting and Award and Execution of Contract," in these special provisions. The superintendent's experience need not be with the Contractor's firm. The superintendent's experience shall include title and responsibilities during each project. The Contractor's project experience shall include a list of the segmental bridge projects which the Contractor has completed successfully using form travelers, including, for each one, the contract value, a brief description of the work, and the name, address and current telephone number of the owner including contact person. The Contractor shall also provide one unbound copy each of a form traveler assembly and operation manual, as well as one unbound copy of a geometry control manual, from a previous cast-in-place segmentally constructed project with the bid for review by the State. The examples shall be from projects constructed by the Contractor.

Reference Standards

The work shall be in accordance with the Standard Specifications, and with the applicable provisions of the 1989 AASHTO Guide Specifications for Design and Construction of Segmental Concrete Bridges (hereinafter the "AASHTO Guide Specifications"), both as amended by these special provisions. These special provisions shall take precedence over the AASHTO Guide Specifications, when the provisions of these are clearly contradictory.

The following sections of Division II Construction Specifications of the 1989 AASHTO Guide Specifications shall be considered to be applicable: 2.7, 2.9, 4.3, 4.5.2, 4.5.3, 4.5.4, 5.0, 8.0, 9.0, 10.0, 11.0, 13.0, and 16.0. Other sections may be included by specific reference in other parts of these special provisions. Sections not included here or elsewhere may be considered to be not applicable; the subjects of these are treated in the Standard Specifications or elsewhere in these special provisions.

If the provisions of the various AASHTO Guide Specifications referenced above and herein are found to be conflicting with Caltrans Standard Specifications or these special provisions, the more stringent requirements will apply, as directed by the Engineer.

Construction Equipment

(A) Formwork. Forms shall conform to the requirements in Section 51-1.05, "Forms," of the Standard Specifications and the following special provisions:

Where sections of forms are to be joined, a maximum offset of 1.5 mm for flat surfaces and 4mm for corners and bends will be permitted.

Forms shall be checked and inspected by the Contractor prior to placing bar reinforcing into each segment to assure proper alignment and geometric accuracy is maintained. Forms which fail to meet the specified casting tolerances shall not be used until such corrections are made to produce segments within the specified tolerances.

(B) Form Travelers. Form travelers shall be designed, detailed, and fabricated in accordance with the applicable provisions of the AASHTO Standard Specifications for Highway Bridges and the AASHTO Guide Specifications for Design and Construction of Segmental Concrete Bridges. Materials shall be in accordance with appropriate ASTM (or equivalent) specifications. Detailed design requirements are given in "Construction Requirements" of this section. The structural design of the Benicia Martinez Bridge and OH is based upon the construction equipment, equipment weight and construction loading shown on the plans. Redesign of the structure to accommodate construction equipment loadings other than those shown on the plans will be the responsibility of the Contractor; see "Cost Reduction Incentive Proposals For Cast-In-Place Segmentally Constructed Bridges" of these special provisions. Attention is also directed to the temporary vertical and horizontal clearance requirements for construction above the shipping channels of the Carquinez Straits.

(C) Tower Cranes. The Contractor's attention is directed to Section 51-1.11, "Construction Methods," of the Standard Specifications and these special provisions. If tower cranes are utilized on the piers to construct the cantilevers or other portions of the structure, redesign of the structure to accommodate construction equipment other than that shown on the plans will be the responsibility of the Contractor; also see "Cost Reduction Incentive Proposals For Cast-In-Place Segmentally Constructed Bridges" of these special provisions.

If tower cranes are used on the piers, the Contractor shall submit complete calculations in accordance with "Submittals" following in this special provision. The calculations shall demonstrate that the pier construction stresses as shown in Table 8-1 of the AASHTO Guide Specifications are not exceeded.

(D) Pier Table Struts. The Contractor shall design and construct pier table struts at all piers shown on the plans to require struts. The pier table strut locations, forces and stiffnesses shown on the plans are based on the assumed construction sequence shown on the plans. If the Contractor changes the construction sequence, pier table struts may or may not be needed to reduce the construction stresses during erection of the superstructure. Attention is directed to the allowable construction stresses shown in Table 8-1 of the AASHTO Guide Specifications. Pier struts may only be supported on the tops of the pier footings. Pier struts will not be allowed off of the pier caps in the waters of the Carquinez Strait. The pier struts shall be designed in accordance with the requirements in Section 51-1.06, "Falsework," of the Standard Specifications and these special provisions. Connections shall be designed to carry tension and compression forces such that the superstructure and pile cap are not adversely affected locally or globally. Connections to the footing and superstructure shall be designed for 150% of the tension force shown on the plans and shall be actively pretensioned to 150% of the tension forces shown on the plans. Local strengthening of the pier tables and pile caps may be required to accommodate the Contractor's pier table struts. Pier table struts shall be placed to load the pile caps and the superstructure soffit as shown on the drawings. Any modifications of the structure needed to accommodate the Contractor's pier table struts, including supporting calculations, shall be submitted as a part of the pier strut submittal to the Engineer for review and approval in accordance with "Submittals" following in this special provision. Intermediate height braces to the piers will be allowed provided all attachments are removed to a depth of 100 mm and the concrete surfaces of the piers repaired to the satisfaction of the Engineer. If the Contractor's construction sequence requires additional or different pier table struts than those shown on the plans, the pier table struts shall meet the same requirements as the struts specified herein.

(E) Temporary Counterweights. The construction sequence shown on the plans utilizes both temporary and permanent counterweights. The location and magnitude of the temporary counterweights are shown in the drawings. Temporary counterweights are placed to balance the unbalanced load on a pier during construction or to mitigate the unwanted long-term effects of creep on the structure.

Temporary counterweights are defined as non-structural dead weight temporarily applied to the superstructure during construction. The Contractor shall provide temporary counterweights at all locations as shown on the plans. The magnitude and locations of the temporary counterweights shown on the plans are based on the assumed construction sequence also shown on the plans. The Contractor's construction sequence may or may not require temporary counterweights. Should the Contractor's construction sequence require temporary counterweights, they will meet the requirements set forth herein. The weight the counterweight may be achieved by any means provided that the location of the center of gravity of the counterweight is placed at the location shown on the drawings with respect to distance from the center line of the pier. Methods of applying and attaching a temporary counterweight to the superstructure are the responsibility of the Contractor and must be approved by the Engineer. The temporary counterweight must be placed or attached to the structure in a manner such that the superstructure is not adversely affected. Ideally, the temporary counterweights should apply the load to the webs of the superstructure. Complete structural details and calculations of temporary counterweights shall be submitted to the Engineer for approval in accordance with "Submittals" below.

Submittals

The Contractor shall submit to the Resident Engineer's Office, for approval in accordance with the provisions in Section 5-1.02, "Plans and Working Drawings," calculations, manuals and working drawings of the Contractor's cast-in-place segmental cantilever construction method. For initial review, 6 sets of such plans, manuals and drawings shall be submitted. After review, between 6 and 12 sets, as requested by the Engineer, shall be submitted to the said Office for final approval and for use during construction. The working drawings and calculations shall be signed by a civil engineer registered in the State of California with proven experience in the design and construction of concrete segmental bridges erected using balanced cantilever techniques. This may be a professional engineer who is an employee of the Contractor or a consulting engineer under contract to the Contractor. The Contractor may utilize more than one person or firm to provide these services. Minimum design experience documentation of at least three cast-in-place balanced cantilever segmentally constructed bridges with spans greater than 120 meters shall be submitted with the Contractor's plans and working drawings.

Working drawings as required in this section shall be separated into several submittal packages for review as outlined in the following table. Review times for each submittal package shall be cumulative. Required submittals relating to this section but not mentioned in the table below may be submitted as a part of any of the submittals mentioned in the table, but the Contractor should note that if they are submitted separately they shall be treated as a separate submittal with a separate review time. Working drawings shall be submitted sufficiently in advance of the start of the affected work to allow time for review by the Engineer and correction by the Contractor of the drawings without delaying the work. Such time shall be proportional to the complexity of the work but in no case shall such time be less than the time shown in the following table after complete drawings and all support data are submitted. The Contractor shall also submit, on a biweekly basis, a

Preferred Segmental Submittal Review List which lists the Contractor's preferred submittal review order and review dates necessary to meet the construction schedule.

Submittal Name	Review Time(weeks)
Contractor's Designer Qualifications	2
Form Traveler Design	4
Hinge Construction(Hinges A and B)	6
Hinge Construction(Hinges C and D)	6
Hinge Construction(Hinge E)	6
Design Calculations(Initial Frame) (Super and Sub-Structure) and Working Drawings. Note: initial frame must be either Frame 2 or Frame 3.	16
Design Calculations(Subsequent Frames) (Super and Sub-Structure) and Working Drawings.	12
Temporary Counterweights	4
Pier Table Struts	4
Form Traveler Operation Manual	4
Geometry Control Plan and Manual	4
Camber Calculations and Casting Curves	6
Tower Cranes (if used)-Superstructure and Substructure Design Calculations	12
Closure Locking Device	4

Working drawings and calculations for the Contractor's cast-in-place segmental cantilever construction method shall include as a minimum:

(A) Form Travelers. Design calculations and detailed drawings of the form travelers; showing loading assumptions and stresses in principal members; component lists with weights; detailed descriptions of methods of assembly, installation, operation, maintenance and removal; and a list of the standards to which the materials will conform. The submittal shall also include:

- (1) Method of support of form travelers.
- (2) Method of attachment of form travelers to previously completed portions of the structure, including step-by-step procedures for moving the form travelers and tensioning the temporary post tensioning bars.
- (3) Control of traveler deflection during casting. The Contractor shall submit a casting plan to the Engineer for approval, showing the sequence of placing of the concrete in the form traveler, and the special measures to be taken, if any, to ensure the integrity of the segments as cast. Particular attention shall be given to the deflection under load of the form traveler.
- (4) Casting plan to minimize distortion of segments being cast.
- (5) Loads imposed on the structure throughout casting and moving operations, including impact and lateral loads.

The above shall be summarized in an "Form Traveler Assembly and Operation Manual." This shall include a detailed step-by-step outline of each construction activity and related form traveler operation, to be followed by field personnel during each phase of superstructure construction.

(B) Design Calculations. Design calculations for construction procedures, as required in Section 10.2 of Division II Construction Specifications of the AASHTO Guide Specifications. In addition, full superstructure, pier and footing design calculations shall also be provided conforming to the following:

The Contractor shall submit full allowable stress and ultimate strength calculations conforming to Caltrans' Bridge Design Specifications, to the procedures currently employed by the State, and to the project specific design criteria titled: "Design Criteria, New Benicia Martinez Bridge, Contract 59S742, Revision 3, dated June 2000 by T.Y. Lin International/CH2M HILL." Upon written request by the Contractor, the Engineer will provide superstructure and substructure live load and seismic forces as well as the maximum unbalanced loading forces on the piers.

The calculations shall include but are not limited to:

1. Calculations showing that the pier concrete stresses due to unbalanced cantilever loading do not exceed allowable stresses shown in Table 8-1, "Allowable Tensile Stresses for Construction Load Combinations" of the AASHTO Guide Specifications. Calculations including the effects of construction sequence and history as well as the effects of temporary construction loads. Calculations shall reflect the Contractor's choice of using deck grinding or the option polyester concrete overlay. Stresses for each segment shall be calculated and reported for the following intermediate construction stages:

2.

- a. immediately after placing concrete in each segment
- b. immediately after stressing cantilever tendons
- c. immediately after releasing and launching for travelers
- d. immediately prior to, and after, placement of closure concrete
- e. immediately prior to, and after, stressing of the first stage post-tensioning through the closure prior to release of the closure formwork
- f. immediately after the release of the closure formwork
- g. following completion of continuity post-tensioning tendons
- h. following completion of span post tensioning tendons
- i. prior to and after all steps during hinge C and D construction
- j. prior to and after removal of all struts and temporary counterweights
- k. before and after any jacking (if jacking is utilized)

(C) Working Drawings. Working drawings, as required in Section 10.3 of Division II Construction Specifications of the AASHTO Guide Specifications. In addition, the following working drawings shall be submitted:

(1) Details and calculations for any localized strengthening for concentrated supports, loads or reactions from any special erection equipment to be placed in locations not already allowed for in the contract plans.

(D) Hinge Construction.

1.) Hinges C and D: Design calculations, detailed drawings and method of erection and operation of the support platform indicated on the plans as being required, including, support platform weights and design loadings during lifting of the steel box girders and steel plate girders. Support platform weight and load application points shall be as shown on the plans. The support platform connecting adjoining cantilevers during construction of the closure segments should allow for independent movement of the two cantilever tips and thus, both translational and rotational capability. The platform shall be designed for all loads and movements of the superstructure including but not limited to: thermal and wind loads and movements as well as alignment loads. Erection systems (to lift the support platform and steel box girder into place) shall be developed which maintain the stresses and deflections within those anticipated by the construction sequence shown on the plans or the Contractor shall submit modifications to the structure necessary to accommodate the proposed erection procedure. Calculations shall also be provided for the Contractor's method of lifting, transporting and positioning the steel plate girders.

2.) Hinge E: Design calculations, detailed drawings and method of erection and operation of a support system, including, support system weights and design loadings and points of load application to the structure. The support system connecting adjoining cantilevers during construction of the hinge closure segments shall be designed for all loads and movements of the superstructure including but not limited to: thermal and wind loads and movements. The support system shall maintain the stresses and deflections within those anticipated by the plans or the Contractor shall submit modifications to the structure necessary to accommodate the proposed support system.

(E) Geometry Control Plan. A geometry control plan shall be submitted conforming to the requirements of Section 8.2, "Geometry Control" of the AASHTO Guide Specifications, including the adjusting procedure to be utilized should the structure, as erected, deviate from the required horizontal or vertical alignment. The plan shall be supported by detailed drawings and calculations as well as details of the survey equipment that will be used. Calculations shall include a review of stresses which will result from misalignment corrections.

The above shall be summarized in a "Geometry Control Manual."

The working drawings shall include detailed camber calculations, tables, and diagrams (Camber and Casting Curves), indicating the predicted elevation of all segment joints at each stage of construction. The calculations shall consider the exact construction equipment to be used and the schedule to be followed, and shall follow the assumptions stated on the plans. Cambers and deflections shall be such that the structure vertical profile, after 20 years, will correspond to the final design elevations shown on the plans plus the residual shown on the plans. The residual camber has been added to the camber shown on the plans using a reversing parabola form. The working drawing shall include

the procedure for measurement of construction camber, including the effects of temperature on the measurements. The camber values shall be of sufficient accuracy to allow the determination of the check point settings for accurately casting the segments. The preparation of camber values shall recognize all deviations from straight line and deformations due to time related deformations, dead load, erection loads, post-tensioning stresses including secondary moments, creep and shrinkage.

The camber working drawings shall also make allowance (or be capable of revision) for possible changes in the construction schedule. They shall provide a step-by-step process to be followed to correct the camber in the event the predicted camber is not being achieved. The above shall be summarized in the "Geometry Control Manual."

As a part of the camber working drawings, the Contractor shall develop casting curves for each cantilever, which should graphically show how the final camber will be achieved.

(F) Check Points. The Contractor shall prepare a table of elevations and alignments required at each stage of construction, at the check points listed below:

a. Two alignment lines located directly above the top of each box girder web shall be required to establish vertical grade and superelevation. The pier table shall have six vertical check points; two at the centerline of the pier; and two at each transverse joint at the end of the pier table. All typical segments shall have two vertical check points at the transverse joint at the free edge of the segment.

b. One alignment line located along the longitudinal centerline of the bridge shall be required to establish horizontal alignment. The pier table shall have three horizontal check points; one at the centerline of the pier; and two at each transverse joint at the end of the pier table. All typical segments shall have one horizontal check point at the transverse joint at the free edge of the segment.

c. All check points shall be placed as close to the transverse joint face of the segments as is practical.

Elevations and alignments shall be checked on each cantilever of a pier at each construction step, i.e., after setting the traveler (a post-launch/pre-pour survey), after casting the segment, after post tensioning of the segment tendons, and after moving of the form traveler on the opposite cantilever. All geometry control hardware cast into any segments, such as elevation bolts and alignment hairpins, shall remain in place for reference and backchecking purposes. They may be removed after all cantilevers in a the same frame have been completed and joined.

(G) Jacking Details. The horizontal jacking force of zero shown on the plans is based on the construction sequence shown on the plans and on achieving the material properties specified herein. Horizontal jacking may be required if the assumed concrete properties in the design that were verified by the Contractor's trial mixes can not be achieved in the field. This should become apparent during the Contractor's concrete quality control testing program. The Contractor shall have all the necessary jacking equipment available for jacking should it prove necessary. Design calculations and detailed drawings of the horizontal jacking indicated on the plans as being required, as directed by the Engineer or as proposed in by the Contractor in his construction sequence, shall be submitted for approval. Horizontal jacking includes, in particular, that required to push frames or cantilevers apart during superstructure construction. Jacking details and modifications of the structure therefor, shall be designed by the Contractor and submitted to the Engineer for approval.

(H) Pier Struts. Design calculations shall include, as a minimum, the maximum and minimum strut design forces, maximum pier unbalanced moments and stresses with corresponding pier axial loads, superstructure and pile cap calculations for receiving and anchoring strut loads, calculations for the pier struts. Drawings shall include all strut details including sequence of installation, stressing and removal details.

(I) Temporary Counterweights. Complete design calculations for the temporary counterweights shall be submitted. Such design calculations shall include, as a minimum, the mass of the counterweight, the maximum pier unbalanced moments and stresses with corresponding pier axial loads, and superstructure stresses resulting from placement of the counterweights. Drawings shall include all counterweight details including location, counterweight attachment and/or placement details (including proposed equipment such as cranes) with loaded area and removal details. The working drawings for the counterweights shall include a detailed description of the placement and removal schedule for the counterweights that is tied directly to the exact operations (such as concrete placements and form traveler advances) in the segment construction schedule.

(J) Permanent Counterweights. Permanent counterweights are defined as non-structural dead weight permanently applied within the superstructure during construction. The contractor shall provide permanent counterweights at all locations shown on the contract drawings. Permanent counterweight details shall conform to those shown on the contract drawings unless otherwise approved by the Engineer. Permanent counterweights shall be constructed using structural concrete, bridge ($f'_c=35$ Mpa). The magnitude and location of the counterweight is based on the assumed construction sequence shown in the drawings. Different materials and details may be used to provide the magnitude of load at the location required consistent with the contract drawings upon approval of the Engineer. The Contractor's construction sequence may or may not require a permanent counterweight. Should the Contractor's construction sequence require permanent counterweights, these counterweights will meet the requirements set forth herein. All

changes to structure details and all revisions to permanent counterweights will be subject to Engineer's approval. Any changes to the permanent counterweights proposed by the Contractor will require submittal of complete structural details and calculations to the Engineer for approval. When concrete is placed as permanent counterweight, it shall be placed and cured in lifts to prevent overloading the bottom slab. The Contractor shall submit placing plans for concrete used as permanent counterweight. The placing plans shall detail the lift heights and the times between lifts.

(K) Thermal Movement and Rotation Control at Closure Segments. The Contractor shall have all span and continuity tendons loaded with strand and prepared for stressing (anchorage heads and wedges in place) prior to placing concrete for the closure pour. Closure pour concrete placement shall commence in the early morning and only when increasing temperatures are predicted for the remainder of the day. Prestressing of span, continuity and transverse tendons in the closure pours shall be at the direction of the Engineer. As soon as the closure pour concrete in the deck has achieved a strength of 17 Mpa, or 12 hours, whichever comes first, two continuity tendons, one in each web, shall be stressed. The two pairs to be stressed shall be the longest continuity tendons that pass through the closure location. Subsequent continuity and span tendons shall be stressed in the order directed by the Engineer based on expected strength gain of the Concrete. The Contractor shall prepare a work plan for the closure concrete placement and subsequent stressing. The work plan shall include the proposed hourly time line and sequence of placing concrete, breaking of cylinders, and stressing of tendons.

A locking device shall hold the cantilevers rigidly in correct vertical, transverse and longitudinal alignment during placement of the closure concrete. The Contractor shall submit details of the device, design calculations and methods of operation of a locking device for locking adjoining cantilevers to prevent relative rotation or movement during placement of concrete in the closure segments. The Contractor shall have crews available to stress tendons every few hours for the two days following placement of closure pour concrete. As a minimum and in addition to the requirements elsewhere in these special provisions, the Contractor shall cast 6 sets of two concrete cylinders at each closure for use in determining strength gain of the closure pour concrete.

The Contractor's work plan and locking device details and calculations, as well as any other closure procedures shall be submitted in a "Cantilever Construction Closure Procedure Manual."

(L) Segment Construction Cycle. Full details of the proposed segment construction cycle, if this differs from that proposed on the plans, with time required for each separate operation.

(M) Tower Cranes. Where the Contractor elects to use tower cranes, design calculations shall include, as a minimum, the crane lifting capacity and self weight (with maximum counterweights), maximum loads applied from the crane to the structure, maximum pier unbalanced moments and stresses with corresponding pier axial loads, pile cap and pier calculations for receiving and anchoring the tower cranes. The calculations shall include the wind loading effects from the crane to the piers. Drawings shall include all details for attaching the cranes to the piers and footings including erection and removal details.

(N) Contractor's Experience. Details of the Contractor's experience, as required in "Contractor's Personnel" of these special provisions.

The Engineer's review of the above data will in no way relieve the Contractor of responsibility for the efficacy and safety of the construction methods and equipment employed, and for conformity of the completed structure to the plans and specifications.

Construction Requirements

(A) Elevations and Alignment. Throughout construction, the Contractor shall check the elevations and alignment of the structure against his/her calculated values and maintain a record of these checks, and of all adjustments and corrections made. Elevation and alignment shall be recorded at each joint for each stage of erection.

Corrective action shall be taken should the structure deviate from the required horizontal alignment by more than 25 mm at any point.

The Contractor's attention is directed to the need to carefully control and monitor the vertical geometry of the segmental construction so that the final profile can be obtained by grinding. Vertical geometry shall be corrected back to theoretical at each segment during construction of the cantilevers except that the maximum slope change between any two consecutive segments shall not exceed 0.003 radians unless otherwise approved in writing by the Engineer. If actual measured elevations consistently vary from the Contractor's predicted elevations, and if, in the opinion of the Engineer, the required profile may not be satisfactorily met, the Engineer may order the Contractor to suspend all cantilever construction work and thoroughly review the camber calculations and material properties. Before restarting cantilever construction, the Engineer and the Contractor's Engineer shall reach a consensus as to the cause of the deviations and the Contractor shall propose necessary adjustments. A record shall be furnished to the Engineer for review by the Engineer at the time each check is made. The Contractor shall also produce and maintain on a daily basis a graphical plot of the vertical and horizontal "as cast" alignments along each vertical and horizontal control line to an exaggerated scale in order to highlight variations. These shall be depicted against both the theoretical geometric vertical and horizontal alignments and casting curves on a continuous layout

of an entire unit of the bridge between expansion joints. This plot shall be maintained in good condition and updated on a daily basis so that it may be used and referenced during construction of the cantilevers. The Contractor shall be responsible for correcting any misalignment at no additional cost to the State.

(B) Construction Sequence. The structural design has been based upon the construction sequence shown on the plans and described hereunder. Any proposal by the Contractor to depart from this sequence will require the prior approval of the Engineer, and shall be accompanied by design calculations and detailed drawings, supporting all proposed deviations. The Contractor's attention is directed to the requirements for cost reduction incentive proposals elsewhere in these special provisions.

The construction sequence assumed for the structural design, is shown on the plans, and is generally as follows:

- (1) The pier table is first cast, and stressed transversely and the transverse tendons grouted. Grouting must be performed and shall have obtained a compressive strength of 30 MPa before the form travelers are erected onto the pier.
- (2) Starting from the pier segment, cantilever segments are cast alternately to either side of the pier, creating two cantilevers out-of-balance by half a segment length. The transverse and cantilever tendons in the segments are stressed, in order, after each segment has reached a compressive strength of 25 MPa.
- (3) Before the closure segment between adjoining cantilevers is cast, a locking device is installed to bring the cantilever ends into vertical, transverse and longitudinal alignment; and to maintain them rigidly in that position.
- (4) The closure segment is then cast. Span tendons are stressed as soon as allowed by the Engineer and as the closure concrete gains strength. Subsequently, the transverse and continuity tendons are stressed, in order.
- (5) After the closure segment compressive strength has reached 25 MPa the locking device is removed.

Exceptions to this general construction sequence are noted on the plans.

(C) Segment Construction Cycle. A fifteen calendar day cycle has been assumed for casting two segments one to each side of a pier (12 calendar day average cycle per pair of segments over the full cantilever lengths at a pier). The following points should be noted:

- (1) In general and unless otherwise noted on the construction sequence shown on the plans, a segment may not be cast on one side of a pier until the opposite segment, already cast, has been stressed and released from the form traveler.
- (2) The Contractor may propose a different segment construction cycle. Any cycle must take account of the need to keep a pair of cantilevers in balance about the pier. In general and unless otherwise shown on the construction sequence shown on the plans, cantilevers may not be out-of-balance by more than half a segment length.

(D) Sequence for Casting each Segment. The anticipated sequence for casting each segment is as follows:

- (1) The traveler is moved forward and into place, carrying the bottom slab soffit form and web outside forms.
- (2) Reinforcement and ducts are placed in the bottom slab and webs.
- (3) Web inside forms, bottom slab upper form and top slab soffit form are moved forward and into place.
- (4) Reinforcement and ducts are placed in the top slab.
- (5) Concrete is placed.

Dimensional tolerances for concrete are given in Table 9 - 1 of Division II of the AASHTO Guide Specifications.

Concrete shall be placed into the forms in accordance with the Contractor's casting plan and in such a manner as to prevent cracking due to form deflection and rotation at the intersection of concrete elements (joints). In addition, concrete shall be placed from the end of the form back towards the existing segment or pier table so that it maximizes deformation of the form traveler and minimizes the tendency of the joint with the existing segment to open.

(E) Segment Deck Finish. The top surface of segments shall receive an ordinary surface finish (prior to grinding), as specified in Section 51-1.18A, Ordinary Surface Finish," of the Standard Specifications. Bleed water or laitance shall be removed from the surface and wasted outside the forms; the concrete surface shall not be worked until the bleed water and laitance are removed from the surface.

The Contractor shall furnish a straight edge at least 600 mm longer than the segment to be used while finishing the deck of the segments. All deck surface irregularities greater than 6 mm indicated by straightedging longitudinally and transversely on the segment shall be corrected while the concrete is still in the plastic stage. Attention is also directed to "Bridge Deck Finish" elsewhere in these special provisions.

(E) Closure Segments. It is expected that the Contractor will align cantilevers to be joined by adjusting cambers as the cantilevers progress. Should the Contractor propose another method of cantilever alignment, however, any proposal shall be supported by design calculations and detailed drawings, which demonstrate to the Engineer's satisfaction that the structure and construction equipment will not be overloaded.

The ends of adjoining cantilevers must be held in rigid alignment during casting and curing of the closure segment by a "locking device" that prevents relative vertical, transverse, or longitudinal movement or rotation.

(F) Form Travelers. Form travelers shall be designed to carry the weight of segments before they are stressed and released, and to transfer this load to the previously erected portions of the structure. They shall fit closely to the previously erected segments so as to make smooth joints. They should shield the structure from rain, and permit work to continue during inclement weather. The form travelers must be capable of adjustment during casting or they must be sufficiently stiff, so as to limit the deflection/distortion of the segments as they are cast. The Contractor shall submit his/her proposed method of anchorage to the Engineer for approval, and show that it will not overload the structure. Any holes required in the structure shall be filled after use with an approved nonshrink grout, to the satisfaction of the Engineer.

Form traveler operations shall be in accordance with the "Form Traveler Operation Manual," described in these special provisions. Before erecting any traveler, the Contractor's Engineer shall inspect the traveler and shall certify in writing that all components are undamaged and in proper working order, that the traveler substantially conforms to the working drawings, and that the material and workmanship are satisfactory for the purpose intended. Any deficiency shall be corrected to the satisfaction of the Engineer before erecting the traveler. A copy of this certification shall be available at the site of the work at all times.

The construction schedule and sequence assumed by the Engineer utilizes five(5) sets of form travelers(5-pair working in tandem). As a minimum, the Contractor shall provide five(5) pairs of form travelers for construction of the segmental portions of the bridge. Construction with fewer sets of form travelers will be considered by the Engineer in accordance with the requirements of "Cost Reduction Incentive Proposal for Cast-in-Place Segmentally Constructed Bridges," of these special provisions.

(H) Stressing and Grouting. Stressing and grouting operations shall conform to the requirements elsewhere in these special provisions and the Standard Specifications.

(I) Sequence. The sequence of segment erection indicated on the plans was prepared for design purposes only. It is the Contractor's responsibility to determine the sequence which will best enable him/her to construct the bridge within the time permitted, and in accordance with the plans and specifications.

(J) Night Work. Night work will be permitted provided the Engineer is satisfied that operations will be performed safely and with no lowering of construction standards, and gives his approval. The Contractor shall submit his/her proposals for lighting of the work area to the Engineer for review.

(K) Embedded Ducts. All embedded post-tensioning ducts shall be secured to the reinforcement at intervals not to exceed 750mm. Small diameter ducts and very flexible ducts may require closer tying.

(L) Bar Reinforcing. Rearrangement of bar reinforcing steel to pass prestress ducts in segmental construction may be permitted upon approval of the Engineer. In no case shall bar reinforcing be cut or removed to permit proper alignment of the post-tensioning ducts. Any bar that cannot be fabricated to clear the ducts shall be replaced by additional bars with adequate lap lengths and details shall be submitted to the Engineer for approval.

(M) Curing and Stripping. Segments shall be cured in accordance with the requirements of Section 90-7.03, "Curing Structures," of the Standard Specifications except that the forms-in-place method need not be used. Curing compound shall be applied to the exterior surfaces of the box within 2 hours of breaking the forms and advancing the form traveler.

(N) Temporary Deck Access Openings. Temporary deck access openings for the Contractor's convenience shall conform to the details shown on the plans. Opening locations and number of openings shall be subject to the approval of the Engineer.

MEASUREMENT AND PAYMENT

Measurement and payment for concrete in structures shall conform to the provisions in Section 51-1.22, "Measurement," and Section 51-1.23, "Payment," of the Standard Specifications and these special provisions.

Full compensation for roughening existing concrete surfaces to a full amplitude of approximately 6 mm, where shown on the plans, shall be considered as included in the contract price paid per cubic meter for structural concrete, bridge and no separate payment will be made therefor.

Full compensation for furnishing and installing access opening covers in soffits of new cast-in-place box girder bridges shall be considered as included in the contract price paid per cubic meter for structural concrete, bridge and no separate payment will be made therefor.

Full compensation for furnishing and installing plastic pipe located at vertical drains used behind retaining walls and bridge abutments, including horizontal or sloping drains, including excavation and backfill involved in placing the plastic pipe, shall be considered as included in the contract price paid per cubic meter for the various items of concrete work involved and no separate payment will be made therefor.

Lightweight structural concrete will be measured and paid for in accordance with the provisions in Section 90-11, "Measurement and Payment," of the Standard Specifications.

Full compensation for the Contractor's Lightweight Concrete Quality Control Plan, including furnishing and placing the practice placement of lightweight concrete, disposal of the sample cubes, taking and disposing of reserve cylinders for each

segment, sampling and testing of lightweight concrete with independent laboratory testing shall be considered as included in the contract price paid per cubic meter for lightweight concrete, bridge and no separate payment will be made therefor.

Full compensation for all measures required to control heat of hydration in mass concrete in accordance with these special provisions, including modeling and monitoring of mass concrete, preparing thermal control plans, monitoring and recording temperature information, pre-cooling of materials, designing and furnishing post-cooling systems (whether used or not) and epoxy injection of thermal cracking shall be considered as included in the contract price paid per cubic meter for the various types of concrete shown on the plans, and no separate payment will be made therefor. No payment will be made for mass concrete placements rejected by the Engineer.

Full compensation for furnishing and placing PVC sleeves at future barrier and transit rail attachments, as shown on the plans and as specified in these special provisions, shall be considered as included in the contract price paid per cubic meter for the various types of concrete shown in the Engineer's estimate and no separate payment will be made therefor.

Full compensation for furnishing and placing PVC sleeves in concrete for future electrical conduits, as shown on the plans and as specified in these special provisions, shall be considered as included in the contract price paid per cubic meter for the various types of concrete in the Engineer's estimate and no separate payment will be made therefor.

Full compensation for removing and disposing of expanded polystyrene from formed areas of joints, as specified in these special provisions and as directed by the Engineer, shall be considered as included in the contract price paid per cubic meter for the various types of concrete shown on the plans and no separate payment will be made therefor.

Full compensation for furnishing and installing waterstops, including embedded wire and/or grommets holes, as shown on the plans and as specified in these special provisions, shall be considered as included in the contract price paid per cubic meter for structural concrete, bridge footing and precast pier footing forms and no additional compensation will be allowed therefor.

Precast pier footing forms will be measured and paid for by the cubic meter as precast pier footing forms. No payment will be made for any portion of the forms in excess of the dimensions shown on the plans. Full compensation for steel rings, for washing with fresh water and draining the precast pier footing forms thereafter shall be considered as included in the contract price paid per cubic meter for precast pier footing forms and no additional compensation will be allowed therefor.

Full compensation for furnishing working drawing and calculations for the precast pier footing forms and for doing all the work associated with constructing, transporting, erecting and supporting the precast pier footing forms, including providing non-ferrous bar reinforcing support chairs, spacers, and form ties, shall be considered as included in the contract price paid per cubic meter for precast pier footing form and no additional compensation will be allowed therefor.

Full compensation for any auxiliary ties or support bars for securing post tensioning ducts shall be considered as included in the contract unit prices paid for the various items of work and no additional compensation will be allowed therefor.

Full compensation for segmentally constructing the superstructure as shown on the plans, including submitting Contractor Qualifications, traveler details, geometry and camber control plans, for furnishing and use of all form travelers, locking devices, and other temporary works and equipment, relocation of conflicting bar reinforcing, addition of bar reinforcing as required to eliminate conflicts, horizontal jacking of the superstructure, and all other submittals required by this special provision shall be considered as included in the contract unit prices paid for the various items of work and no additional compensation will be allowed therefor.

TEMPORARY HINGE TIEDOWNS

Temporary hinge tiedowns at Pier 17, complete with anchorages, shall be installed and tensioned as shown on the plans within 10 days after completion of longitudinal post-tensioning and before releasing bridge falsework in the hinge span and adjoining span, unless otherwise directed by the Engineer.

Working drawings and calculations for temporary hinge tiedowns shall be submitted in conformance with the provisions for working drawings for prestressing systems in Section 50-1.02, "Drawings," of the Standard Specifications. The working drawings and calculations shall be signed by a civil engineer registered in the State of California. Working drawings shall include details of the procedures and methods for the gradual tensioning and detensioning of the hinge tiedowns. The Contractor shall allow 3 weeks after complete drawings and all support data are submitted for the review of working drawings.

Hinge tiedowns and anchorages shall be made from materials that do not yield during an extended period of time under sustained loading. The hinge tiedowns shall provide for checking and simple adjustment of the force during their service life using commonly available equipment and tools. The hinge tiedowns shall provide for easy and gradual detensioning, simple removal and a minimal amount of repair to the bridge surfaces after removal. The tiedowns shall be cased for a height of 3 m above the ground surface with plastic pipe or steel pipe held in place with vandal resistant retaining devices. Anchorages shall be covered and protected from vandalism.

Metal exposed to the atmosphere shall be protected from corrosion at least equivalent to the protection afforded by cleaning and priming with inorganic zinc primer.

The hinge tiedowns shall not impair the structural integrity of the bridge or its foundation. The design of hinge tiedown anchorages shall include any strengthening of bridge components and foundation material necessary to support the hinge tiedown anchorages, including providing for the moments and loads induced into the substructure and foundations. Additional concrete, reinforcement and other materials necessary to accommodate the hinge tiedowns shall be provided. Such additions shall conform to the provisions for similar work in these special provisions and the Standard Specifications. Rearrangement of reinforcing steel, prestressing steel and other bridge materials necessary to accommodate the hinge tiedowns shall be shown on the working drawings.

Hinge tiedowns shall not be attached to the bridge columns unless otherwise shown on the plans.

Stressing of high-tensile wire, strand or bars shall conform to the provisions in Section 50-1.08, "Prestressing," of the Standard Specifications.

Hinge tiedowns shall be tensioned after prestressing the concrete and before releasing the falsework in the supporting hinge span and adjoining span. The tension force shall be as shown on the plans.

Tiedowns shall be constructed at the locations shown on the plans and stressed to the force levels shown on the plans. No more than one-half of the tension force at a tiedown shall be applied before an equal force is applied at the adjacent tiedowns. At no time during the tensioning operations shall more than one-sixth of the tension force for the entire hinge be applied eccentrically about the centerline of the structure.

The hinge tiedowns shall remain fully tensioned until the supported span in the adjoining frame of Contract 006061 and Hinges A and B are constructed.

All the concrete at the hinge, except concrete above the bridge deck, shall be in place for a period of at least 10 days before detensioning tiedowns that are to be removed on this project. The hinge tiedowns that are to be removed shall be gradually detensioned and removed before releasing superstructure falsework in the supported span.

Detensioning of each tiedown shall be in increments such that not more than one-half of the total tension force at the tiedown is released before releasing an equal force at the adjacent tiedowns. At no time during detensioning operations shall more than one-sixth of the tension force for the entire hinge be applied eccentrically about the centerline of the structure. Wires, strands, or bars shall be detensioned before cutting or removing them or their anchorages.

Blockouts and recesses remaining in the structure after removal of the tiedowns shall be filled with nonshrink grout and finished to match the surrounding surfaces. Embedded fasteners and metal parts shall be removed in conformance with the provisions for form bolts in Section 51-1.18A, "Ordinary Surface Finish," of the Standard Specifications. Temporary hinge tiedowns will be measured and paid for on a unit basis, based on the number of tendon anchors provided.

The contract price paid for temporary hinge tiedown, including furnishing, installing, maintaining and removing the tiedowns, and including additional concrete, reinforcement, earthwork, and any materials to be left in place, but excluding ducts cast into the Pier 17 footing, shall be considered as included in the contract unit price paid for temporary hinge tiedown and no separate payment will be made therefor.

Full compensation for furnishing and installing the temporary hinge tiedown ducts within the Pier 17 footing, including any additional reinforcement required by the prestressing system, and for filling the ducts with nonshrink grout after the ducts are no longer needed, shall be considered as included in the contract price paid per cubic meter for structural concrete, bridge footing and no separate payment will be made therefor.

COST REDUCTION INCENTIVE PROPOSALS FOR CAST-IN-PLACE PRESTRESSED BOX GIRDER BRIDGES CONSTRUCTED ON FALSEWORK

Except as provided herein, cast-in-place prestressed box girder bridges constructed on falsework shall be constructed in conformance with the details shown on the plans and the provisions in Section 50, "Prestressing Concrete," and Section 51, "Concrete Structures," of the Standard Specifications.

For cost reduction incentive proposals regarding the cast-in-place segmentally constructed portion of the bridge, the contractor's attention is directed to "Cost Reduction Incentive Proposals For Cast-In-Place Segmentally Constructed Bridges" of these special provisions.

If the Contractor submits cost reduction incentive proposals for cast-in-place prestressed box girder bridges, the proposals shall be in conformance with the provisions in Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications and these special provisions.

The Engineer may reject any proposal which, in the Engineer's judgment, may not produce a structure which is at least equivalent to the planned structure.

At the time the cost reduction incentive proposal (CRIP) is submitted to the Engineer, the Contractor shall also submit 4 sets of the proposed revisions to the contract plans, design calculations, and calculations from an independent checker for all changes involved in the proposal, including revisions in camber, predicted deck profile at each construction stage, and falsework requirements to the Resident Engineer's Office at 757 Arnold Drive, Suite 200 Martinez, California 94553 at telephone number (925) 646-1996. When notified in writing by the Engineer, the Contractor shall submit 12 sets of the CRIP plan revisions and calculations to the Office of Structure Design for final approval and use during construction. The

calculations shall verify that all requirements are satisfied. The CRIP plans and calculations shall be signed by an engineer who is registered as a Civil Engineer in the State of California.

The CRIP plans shall be either 279 mm x 432 mm, or 559 mm x 864 mm in size. Each CRIP plan sheet and calculation sheet shall include the State assigned designations for the contract number, bridge number, full name of the structure as shown on the contract plans, and District-County-Route-Kilometer Post. Each CRIP plan sheet shall be numbered in the lower right hand corner and shall contain a blank space in the upper right hand corner for future contract sheet numbers.

Within 3 weeks after final approval of the CRIP plan sheets, one set of the corrected good quality prints on 75-g/m² (minimum) bond paper, 559 mm x 864 mm in size, of all CRIP plan sheets prepared by the Contractor for each CRIP shall be furnished to the Office of Structure Design, Documents Unit.

Each CRIP shall be submitted prior to completion of 25 percent of the contract working days and sufficiently in advance of the start of the work that is proposed to be revised by the CRIP to allow time for review by the Engineer and correction by the Contractor of the CRIP plans and calculations without delaying the work. The Contractor shall allow a minimum of 10 weeks for the review of a CRIP. In the event that several CRIPs are submitted simultaneously, or an additional CRIP is submitted for review before the review of a previously submitted CRIP has been completed, the Contractor shall designate the sequence in which the CRIPs are to be reviewed. In this event, the time to be provided for the review of any proposal in the sequence shall be not less than the review time specified herein for that proposal, plus 2 weeks for each CRIP of higher priority which is still under review.

Should the review not be complete by the date specified in the Contractor's CRIP, or such other date as the Engineer and Contractor may subsequently have agreed to in writing and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in review of CRIP plans and calculations, an extension of time commensurate with the delay in completion of the work thus caused will be granted as provided in Section 8-1.07, "Liquidated Damages," of the Standard Specifications except that the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications shall not apply.

Permits and approvals required of the State have been obtained for the structures shown on the plans. Proposals which result in a deviation in configuration may require new permits or approvals. The Contractor shall be responsible for obtaining the new permits and approvals before the Engineer will reach a decision on the proposal. Delays in obtaining permits and approvals will not be reason for granting an extension of contract time.

All proposed modifications shall be designed in conformance with the bridge design specifications and procedures currently employed by the Department and the project specific design criteria titled: "Design Criteria, New Benicia Martinez Bridge, Contract 59S742, Revision 2, dated September 1, 1998 by T.Y. Lin International/CH2M HILL." The proposal shall include all related, dependent or incidental changes to the structure and other work affected by the proposal. The proposal will be considered only when all aspects of the design changes are included for the entire structure. Changes, such as but not limited to, additional reinforcement and changes in location of reinforcement, necessary to implement the CRIP after approval by the Engineer, shall be made at the Contractor's expense.

Modifications may be proposed in (1) the thickness of girder stems and deck slabs, (2) the amount and location of reinforcing steel, and (3) the amount and location of prestressing force in the superstructure. The strength of the concrete used may be increased but the strength employed for design or analysis shall not exceed 45 MPa.

Modifications proposed to the minimum amount of prestressing force which must be provided are subject to the provisions in "Prestressing Concrete" of these special provisions.

No modifications will be permitted in (1) the foundation type, (2) the span lengths or (3) the exterior dimensions of columns or bridge superstructure. Fixed connections at the tops and bottoms of columns shown on the plans shall not be eliminated.

The Contractor shall be responsible for determining construction camber and obtaining the final profile grade as shown on the plans.

The Contractor shall reimburse the State for the actual cost of investigating CRIPs for cast-in-place prestressed box girder bridges constructed on falsework submitted by the Contractor. The Department will deduct this cost from any moneys due, or that may become due the Contractor under the contract, regardless of whether or not the proposal is approved or rejected.

COST REDUCTION INCENTIVE PROPOSALS FOR CAST-IN-PLACE SEGMENTALLY CONSTRUCTED PRESTRESSED BOX GIRDERBRIDGES

Except as provided herein, cast-in-place segmentally constructed prestressed box girderbridges shall be constructed in conformance with the details shown on the plans and the provisions in Section 50, "Prestressing Concrete," and Section 51, "Concrete Structures," of the Standard Specifications.

If the Contractor submits cost reduction incentive proposals for the cast-in-place segmentally constructed portion of the bridge, the proposals shall be in accordance with the provisions of Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications and these special provisions.

The Engineer may reject any proposal which, in the Engineer's judgment, may not produce a structure which is at least equivalent to the planned structure. Cost reduction incentive proposals for segmentally constructed structures may require partial or full redesign of the bridge superstructure and/or the bridge substructure.

Prior to submitting a cost reduction incentive proposal (CRIP) the Contractor shall make a conceptual submittal and presentation sufficient for the Engineer to judge the quality of the CRIP to be proposed. As a minimum the conceptual submittal shall include:

- (1) A detailed description of the construction method or proposed change, with conceptual drawings and preliminary design calculations.
- (2) Itemization of redesigns necessary to accommodate the change or method in accordance with the project specific design criteria and these special provisions.
- (3) A construction schedule showing completion of the project within the required number of working days.
- (4) Evidence of the Contractor's experience using the method, if applicable.
- (5) An estimate of the net construction cost savings.

Conceptual design submittals shall be made in accordance with the requirements for submitting CRIPs of this special provision except that all conceptual submittals shall be made in 10 copies. The review time for a conceptual design submittal shall be 2 weeks. If the Contractor's conceptual design submittal is approved by the Engineer, the Contractor may submit the CRIP in accordance with the requirements of this special provision. Approval of a conceptual submittal in no way constitutes approval nor guarantees future approval of the Contractor's CRIP.

At the time the CRIP is submitted to the Engineer, the Contractor shall also submit 4 sets of the proposed revisions to the contract plans, design calculations, and calculations from an independent checker for all changes involved in the proposal, including revisions in camber, predicted deck profile at each construction stage, and falsework requirements to the Resident Engineer's Office at 757 Arnold Drive, Suite 200 Martinez, California 94553 at telephone number (925) 646-1996. When notified in writing by the Engineer, the Contractor shall submit 12 sets of the CRIP plan revisions and calculations to said Office for final approval and use during construction. The calculations shall verify that all requirements are satisfied. The CRIP plans and calculations shall be signed by an engineer who is registered as a Civil Engineer in the State of California.

The CRIP plans shall be either 279 mm x 432 mm, or 559 mm x 864 mm in size. Each CRIP plan sheet and calculation sheet shall include the State assigned designations for the contract number, bridge number, full name of the structure as shown on the contract plans, and District-County-Route-Kilometer Post. Each CRIP plan sheet shall be numbered in the lower right hand corner and shall contain a blank space in the upper right hand corner for future contract sheet numbers.

Within 3 weeks after final approval of the CRIP plan sheets, one set of the corrected good quality prints on 75-g/m² (minimum) bond paper, 559 mm x 864 mm in size, of all CRIP plan sheets prepared by the Contractor for each CRIP shall be furnished to the Resident Engineer's Office.

Each CRIP shall be submitted prior to completion of 10 percent of the contract working days and sufficiently in advance of the start of the work that is proposed to be revised by the CRIP to allow time for review by the Engineer and correction by the Contractor of the CRIP plans and calculations without delaying the work. The Contractor shall allow a minimum of 10 weeks for the review of a CRIP. In addition, the Contractor shall allow a minimum of 16 weeks per frame for the review of a CRIP which includes changes to the segment length. In the event that several CRIPs are submitted simultaneously, or an additional CRIP is submitted for review before the review of a previously submitted CRIP has been completed, the Contractor shall designate the sequence in which the CRIPs are to be reviewed. In this event, the time to be provided for the review of any proposal in the sequence shall be not less than the review time specified herein for that proposal, plus 2 weeks for each CRIP of higher priority which is still under review.

Should the review not be complete by the date specified in the Contractor's CRIP, or such other date as the Engineer and Contractor may subsequently have agreed to in writing and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in review of CRIP plans and calculations, an extension of time commensurate with the delay in completion of the work thus caused will be granted as provided in Section 8-1.07, "Liquidated Damages," of the Standard Specifications except that the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications shall not apply.

Permits and approvals required of the State have been obtained for the structures shown on the plans. Proposals which result in a deviation in configuration may require new permits or approvals. The Contractor shall be responsible for obtaining the new permits and approvals before the Engineer will reach a decision on the proposal. Delays in obtaining permits and approvals will not be reason for granting an extension of contract time.

All proposed modifications shall be designed in conformance with the bridge design specifications and procedures currently employed by the Department and the project specific design criteria titled: "Design Criteria, New Benicia Martinez Bridge, Contract 59S742, Revision 3, dated January 2000 by T.Y. Lin International/CH2M HILL." The proposal shall include all related, dependent or incidental changes to the structure and other work affected by the proposal. The proposal will be considered only when all aspects of the design changes are included for the entire structure. Changes, such as but not

limited to, additional reinforcement and changes in location of reinforcement, necessary to implement the CRIP after approval by the Engineer, shall be made at the Contractor's expense.

Modifications may be proposed as follows:

- (A) Construction Sequence. Variation in construction sequence, or direction of construction. Whatever the sequence or direction, cantilevers must remain in balance until span closure, as described in "Segmentally Erected Superstructure" of these special provisions.
- (B) Segment Length. Variation in segment length shall consider the changes in the amount of prestressing and its distribution and layout, transverse rib location, camber and required reinforcing changes. Continuity of reinforcing across construction joints shall be maintained.
- (C) Post-Tensioning System or Method. Any different system or method, to receive consideration, must have been used successfully in multi-span, cast-in-place prestressed concrete segmental bridges. Evidence of such use shall be submitted to the Engineer for review. Prestress losses shall be calculated based on the construction schedule. Whatever the system, cantilever, span, continuity and top slab tendons must all be provided; at least 1/2 of the total post-tensioning force in closure segments must be derived from tendons continuous over the entire span. Local changes in the dimensions of elements (such as anchorage blisters) of the structure to accommodate a different system or method will be permitted. The thickness of primary structural elements shall not be reduced. Additionally, the external dimensions of the structure shall not be altered. Attention is also directed to the requirements in "Prestressing Concrete" of these special provisions.
- (D) Modification of the structure to accommodate alternative construction methods and equipment will be permitted; only necessary modifications will be permitted. The overall dimensions of the structure (including, but not limited to, the box girder depth, span lengths and location of fixed and expansion piers) shall not be altered. Additionally, the thicknesses of the elements of the structure (including, but not limited to, slab depths and web thicknesses) shall not be reduced.
- (E) Number of Form Travelers: the Contractor may propose using fewer than five sets of form travelers. Proposals will only be considered provided the same project completion date is achieved. Additionally, it is anticipated that the cambers shown on the plans will have to be recalculated and that the resulting change in sequence may require partial redesign of the superstructure and/or substructure by the Contractor.

No modifications will be permitted in (1) the foundation type, (2) the use of lightweight concrete in the superstructure or (3) the exterior dimensions of columns. Fixed connections at the tops and bottoms of columns shown on the plans shall not be eliminated.

The Contractor shall be responsible for determining construction camber and obtaining the final profile grade as shown on the plans.

The Contractor shall reimburse the State for the actual cost of investigating conceptual CRIP submittals and CRIPs for cast-in-place segmentally constructed prestressed box girder bridges submitted by the Contractor. The Department will deduct this cost from any moneys due, or that may become due, the Contractor under the contract, regardless of whether or not the proposal is approved or rejected.

ELASTOMERIC BEARING PADS

Elastomeric bearing pads shall conform to the provisions in Section 51-1.12H, "Elastomeric Bearing Pads," of the Standard Specifications and these special provisions.

The table in the ninth paragraph of Section 51-1.12H(1), "Plain and Fabric Reinforced Elastomeric Bearing Pads," of the Standard Specifications is amended to read:

Tensile strength, percent	-15
Elongation at break, percent	-40; but not less than 300% total elongation of the material
Hardness, points	+10

NONSHRINK GROUT

This work shall consist of cleaning the surfaces and furnishing, placing and finishing nonshrink grout. Nonshrink grout shall be placed in accordance with the details shown on the plans and these special provisions.

The nonshrink grout shall be a nonmetallic and nongas-liberating flowable fluid containing natural aggregate, Portland Cement and additives and requiring only the addition of water. Grout shall contain a minimum of 390 kg of cement per cubic meter. Nonshrink grout shall be premeasured and prepackaged by the manufacturer, and shall be suitable for baseplate and foundation grouting. Aggregate shall show no segregation or settlement at fluid consistency at specified times or

temperatures. One hour after mixing, the grout shall pass through a flow cone with continuous flow. Nonshrink grout shall conform to the requirements of ASTM Designation: C 1107-91, and the following additional requirements:

Property	Requirement	Test
Shrinkage	0.0%	ASTM C 827
Expansion	0.0% min., 4.0% max.	ASTM C 827
Fluid Consistency	20-30 seconds at 5 to 38 deg C	CORPS-CRD-611- 81
1-day compressive strength	24 Mpa (3500 psi. min.)	ASTM C 109
3-day compressive strength	35 Mpa	ASTM C 109
28-day compressive strength	52 Mpa	ASTM C 109

Nonshrink grout shall be formulated for minimum initial set time of 4 hours and minimum final set time of 6 hours at 21C). The materials, prior to use, shall be stored in a cool, dry environment. Grout shall be free from chlorides and other corrosion-causing chemicals. Grout shall be designed for an air content of 4 to 6 percent.

Mix water shall conform to the requirements of Section 90-2.03, "Water," of the Standard Specifications. Cold water shall be used in hot weather conditions to maintain the mixed grout temperature from 7°C to 32°C.

Nonshrink grout shall be mixed and placed in accordance with the requirements of the manufacturer, these special provisions and as approved by the Engineer.

The quantity of water to be blended with the dry component, shall be within the limits recommended by the manufacturer. The quantity of water shall be the least amount required to produce a flowable or fluid batter as required for the application, and as approved by the Engineer.

Before using nonshrink grout material, a minimum of 20 kilograms shall be submitted to the Engineer for testing. The Contractor shall allow 45 days for the testing. Additionally, the Contractor shall submit for approval, specific printed manufacturer's product data, curing methods and proposed methods for keeping the surface wet prior to grout application for each nonshrink grout location. Non-shrink properties shall not be based on gas or gypsum expansion.

Cleaning the contact surfaces of existing concrete shall be accomplished by abrasive blast cleaning the concrete and any exposed reinforcing steel, as necessary, to remove all rust, paint, grease, asphalt or other foreign materials. A minimum of 3 mm of concrete shall be removed. Steel contact surfaces shall be cleaned by methods approved by the Engineer to remove all rust, paint, grease, or other foreign materials. Immediately prior to placing the nonshrink grout, the surfaces shall be recleaned by air blasting, or by other approved means, as necessary to remove any debris which has accumulated during construction or after abrasive blast cleaning. Prior to grouting all concrete contact surfaces shall be kept constantly wet for a period of 24-hours. The surface temperature of the areas to be covered shall be between 7C and 32C when the nonshrink grout is placed. Methods proposed to heat said surfaces are subject to approval by the Engineer. The condition of the concrete contact surface shall be saturated surface-dry when the nonshrink grout is placed.

Forms shall be nonabsorbent, water tight and shall conform to the requirements of Section 51-1.05, "Forms," of the Standard Specifications. Forms shall extend 50 mm higher than the top surface of the grout to be placed.

Nonshrink grout shall be cured just after initial set by flooding with water to the top of the form or temporary dam built to pond water above the surface of the newly placed grout. The water level shall be maintained above the top level of the grout for a period of 48 hours. After 48 hours of ponding, the nonshrink grout shall be sprayed with two coats of curing compound (1) of Section 90-7.01B, "Curing Compound Method," of the Standard Specifications.

Field evaluation of nonshrink grout: The Contractor shall provide a flow cone and cube molds with restraining plates onsite. Three 50 mm by 50 mm cubes shall be made by the Contractor for each 0.5 cubic meter of nonshrink grout used. Restraining caps shall be provided for the cube molds in accordance with CRD-C-621-83. Store cubes at 21C. Nonshrink grout cubes shall test equal to or greater than minimum 28-day strength. Test reports for cubes shall be submitted to the Engineer for approval.

Nonshrink grout used in prestressing anchorage blockouts within the footings and used between the piles and the steel ring forms in the precast footings forms shall be extended by adding properly graded, dust-free, hard, 13 mm diameter rounded aggregate supplied by the grout manufacturer. Nonshrink grout extended with aggregate shall be internally vibrated. Calcareous aggregate made from soft limestone shall not be used. Mix proportions shall be in conformance with manufacturer's written recommendations. The extended grout/aggregate mix shall meet the specified strength requirements for nonshrink grout.

Full compensation for furnishing, placing, testing and finishing nonshrink grout, including cleaning surfaces and applying bonding agent(if required elsewhere in these special provisions or on the plans), and water curing shall be considered as included in the contract price paid for various work items involved and no additional compensation will be allowed therefor.

CURING

The bridge deck on the pier tables and all portions of the segmentally cast superstructure shall be cured in accordance with the provisions in Section 90-7.03, "Curing Structures," of the Standard Specifications except that a total of 14 days of cure by the water method shall be used instead of 7 days.

PRECAST PIER FOOTING FORMS

Precast pier footing forms shall conform to the provisions in Section 51, "Concrete Structures," of the Standard Specifications and these special provisions.

Attention is directed to "Falsework," "Nonshrink Grout," "Prestressing Concrete," "Mass Concrete," "Steel Structures" and "Epoxy-coated Reinforcing Steel" of these special provisions. Precast pier footing forms may be precast off-site, cast-in-place on-site on falsework above the maximum high tide line, or cast-in-place to grade within a cofferdam (Piers 6, 16 and 17).

All form ties, spacers, support chairs and hangers used to support bar reinforcing steel in the forms for the precast pier footing forms shall be non-ferrous. Mortar block spacers shall not be used against any surface exposed to seawater or within the splash zone. Plastic coated and epoxy coated ferrous products will not be allowed. Wall spacers shall be the clip-on wheel type or other suitable spacers designed to minimize contact with the forms. Where form ties or form spacer ties are used in the pier footings, they shall have a waterstop midway along their length. All interior and top surfaces of the precast pier footing forms shall be cleaned of surface laitance and curing compound before placing footing concrete inside the forms. Interior and top surfaces shall be roughened in accordance with "Concrete Structures" of these special provisions. No more than four hours prior to placing concrete within the precast pier footing forms, the Contractor shall thoroughly wash the interior and top of the form walls and the bottom of the footing form with clean potable water to remove salts that may have accumulated. Washing shall be accomplished by spraying all concrete surfaces with water from a 50 mm diameter fire hose or by pressure washing using high pressure water jets. The Contractor shall remove all standing water from the footing form prior to placing concrete into the form. All handling or anchoring hardware which will remain permanently within 100 mm of exposed portions of the precast pier footing forms shall be fabricated of stainless steel conforming to ASTM A-276, Type 316 in the annealed or cold worked condition. When male fittings are removed for inserts, the cavity shall first be cleaned of all grease or wax and then coated with an epoxy bonding agent before being filled with nonshrink grout conforming to these special provisions. Bonding agent shall be applied in conformance with manufacturer's written instructions.

The Contractor shall ensure that precast pier footing forms are at all times handled, stored, transported, and secured in a manner that will not cause damage to the forms.

Design of the precast pier footing forms was done by the Engineer for the load cases and support conditions shown on the plans only. Continuous falsework support around the perimeter of each pile penetration has been assumed in the design of the precast pier footing forms. No allowance was made in the design for lifting, towing or other transportation and handling loads which the precast pier footing forms may be subject to. Should the Contractor elect to tow or lift the footing forms, or to support the footing forms other than as specified, all required modifications shall be the responsibility of the Contractor. Any modifications to the precast pier footing forms shall be supported by the submittal of complete calculations and details.

The Contractor shall develop and submit for review, structural calculations addressing all phases of fabrication, transportation (towing, barging, lifting etc.), and installation of the precast pier footing forms. All handling and support calculations for "normal" load cases shall be based on working stress design assuming 50 percent impact on dead load with zero tension in the concrete slab unit. "Normal" loads include fluid hydrostatic loads, tidal action (current and rise/fall), dead loads, and construction live loads. Calculations for "extreme" load cases such as those that include impact or loss of support from wave action, and wind loads shall be based on working stress design with tension in the concrete slab unit limited to 0.5 times the square root of the specified compression strength (MPa).

Working drawings and calculations for the precast pier footing forms shall be submitted to the Resident Engineer's Office for approval in accordance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. The working drawings shall show complete details of the footing forms and the intended methods of

transporting and positioning the footing forms at the site, including details of seals and covers necessary for transporting the footing forms and any rearrangements or addition of the reinforcing steel or any other item from those shown on the plans. For initial review, 5 sets of drawings and calculations shall be submitted. After review, between 6 and 12 sets, as requested by the Engineer, shall be submitted to Resident Engineer's Office for final approval and use during construction.

The working drawings and supplemental complete calculations shall be prepared for each size of footing form. Working drawings shall be either 279 mm x 432 mm or 559 mm x 864 mm in size and each drawing and calculation sheet shall the name of the structure as shown on the contract plans, District-County-Route, bridge number, and contract number. The engineer's name, address, and phone number shall be shown on the working drawings. Each sheet shall be numbered in the lower right hand corner and shall contain a blank space in the upper right hand corner for future contract sheet numbers.

Calculations and working drawings shall be stamped and signed by an engineer who is registered as a civil engineer registered in the State of California. The Contractor shall allow the Engineer 4 weeks to review the drawings and calculations for the precast pier footing forms after a complete set has been received.

10-1.46 ARCHITECTURAL SURFACE (TEXTURED CONCRETE)

Architectural texture for concrete surfaces shall conform to the details shown on the plans and the provisions in Section 51, "Concrete Structures," of the Standard Specifications and these special provisions.

Architectural textures listed below are required at concrete surfaces shown on the plans:

A. Fractured rib texture

The fractured rib texture shall be an architectural texture simulating the appearance of straight ribs of concrete with a fractured concrete texture imparted to the raised surface between the ribs. Grooves between ribs shall be continuous with no apparent curves or discontinuities. Variation of the groove from straightness shall not exceed 6 mm for each 3 m of groove. The architectural texture shall have random shadow patterns. Broken concrete at adjoining ribs and groups of ribs shall have a random pattern. The architectural texture shall not have secondary patterns imparted by shadows or repetitive fractured surfaces.

TEST PANEL

A test panel at least 1.25 m x 1.25 m in size shall be successfully completed at a location approved by the Engineer before beginning work on architectural textures. Test panels may not be incorporated into the construction. The test panel shall be constructed and finished with the materials, tools, equipment and methods to be used in constructing the architectural texture. If ordered by the Engineer, additional test panels shall be constructed and finished until the specified finish, texture and color are obtained, as determined by the Engineer.

The test panel approved by the Engineer shall be used as the standard of comparison in determining acceptability of architectural texture for concrete surfaces.

FORM LINERS

Form liners shall be used for textured concrete surfaces and shall be installed in conformance with the manufacturer's recommendations, unless other methods of forming textured concrete surfaces are approved by the Engineer. Form liners shall be manufactured from an elastomeric material or a semi-elastomeric polyurethane material by a manufacturer of commercially available concrete form liners. No substitution of other types of formliner material will be allowed. Form liners shall leave crisp, sharp definition of the architectural surface. Recurring textural configurations exhibited by repeating, recognizable shadow patterns shall be prevented by proper casting of form liner patterns. Textured concrete surfaces with such recurring textural configurations shall be reworked to remove such patterns as approved by the Engineer or the concrete shall be replaced.

Form liners shall have the following properties:

Description	ASTM Designation:	Range
Elastomeric material		
Shore A hardness	D 2240	20 to 65
Tensile strength (MPa)	D 412	0.9 to 6.2
Semi-elastomeric polyurethane		
Shore D hardness	D 2240	55 to 65
Tensile strength (MPa)	D 2370	18 minimum

Cuts and tears in form liners shall be sealed and repaired in conformance with the manufacturer's recommendations. Form liners that are delaminated from the form shall not be used. Form liners with deformations to the manufactured surface caused by improper storage practices or any other reason shall not be used.

Form liners shall extend the full length of texturing with transverse joints at 2.5 m minimum spacing. Small pieces of form liners shall not be used. Grooves shall be aligned straight and true. Grooves shall match at joints between form liners. Joints in the direction of grooves in grooved patterns shall be located only in the depressed portion of the textured concrete. Adjoining liners shall be butted together without distortion, open cracks or offsets at the joints. Joints between liners shall be cleaned before each use to remove any mortar in the joint.

Adhesives shall be compatible with the form liner material and with concrete. Adhesives shall be approved by the liner manufacturer. Adhesives shall not cause swelling of the liner material.

RELEASING FORM LINERS

Products and application procedures for form release agents shall be approved by the form liner manufacturer. Release agents shall not cause swelling of the liner material or delamination from the forms. Release agents shall not stain the concrete or react with the liner material. For reliefs simulating fractured concrete or wood grain surfaces the application method shall include the scrubbing method using a natural bristle scrub brush in the direction of grooves or grain. The release agent shall coat the liner with a thin film. Following application of form release agent, the liner surfaces shall be cleaned of excess amounts of agent using compressed air. Buildup of form release agent caused by the reuse of a liner shall be removed at least every 5 uses.

Form liners shall release without leaving particles or pieces of liner material on the concrete and without pulling or breaking concrete from the textured surface. The concrete surfaces exposed by removing forms shall be protected from damage.

ABRASIVE BLASTING

The architectural texture shall be abrasive blasted with fine abrasive to remove the sheen without exposing coarse aggregate.

CURING

Concrete surfaces with architectural texture shall be cured only by the forms-in-place or water methods. Seals and curing compounds shall not be used.

MEASUREMENT AND PAYMENT

Architectural texture will be measured and paid for by the square meter.

The contract price paid per square meter for architectural texture of the types listed in the Engineer's Estimate shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work

involved in architectural texture, complete in place, including test panels, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.47 **STRUCTURE APPROACH SLABS (Type N)** This work shall consist of constructing reinforced concrete approach slabs, structure approach drainage system, and treated permeable base at structure approaches in conformance with the details shown on the plans, the provisions in Section 51, "Concrete Structures," of the Standard Specifications, and these special provisions.

GENERAL

Attention is directed to the section "Engineering Fabrics" of these special provisions.

STRUCTURE APPROACH DRAINAGE SYSTEM

Geocomposite Drain

Geocomposite drain shall consist of a manufactured core not less than 6.35 mm thick nor more than 50 mm thick with one or both sides covered with a layer of filter fabric that will provide a drainage void. The drain shall produce a flow rate, through the drainage void, of at least 25 liters per minute per meter of width at a hydraulic gradient of 1.0 and a minimum externally applied pressure of 168 kPa. A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications shall be furnished for the geocomposite drain certifying that the drain produces the required flow rate and complies with these special provisions. The Certificate of Compliance shall be accompanied by a flow capability graph for the geocomposite drain showing flow rates and the externally applied pressures and hydraulic gradients. The flow capability graph shall be stamped with the verification of an independent testing laboratory.

Filter fabric for the geocomposite drain shall conform to the provisions for fabric for underdrains in Section 88, "Engineering Fabrics," of the Standard Specifications and "Engineering Fabrics," of these special provisions.

The manufactured core shall be either a preformed grid of embossed plastic, a mat of random shapes of plastic fibers, a drainage net consisting of a uniform pattern of polymeric strands forming 2 sets of continuous flow channels, or a system of plastic pillars and interconnections forming a semirigid mat.

The core material and filter fabric shall be capable of maintaining the drainage void for the entire height of geocomposite drain. Filter fabric shall be integrally bonded to the side of the core material with the drainage void. Core material manufactured from impermeable plastic sheeting having nonconnecting corrugations shall be placed with the corrugations approximately perpendicular to the drainage collection system.

The geocomposite drain shall be installed with the drainage void and the filter fabric facing the embankment. The fabric facing the embankment side shall overlap a minimum of 75 mm at all joints and wrap around the exterior edges a minimum of 75 mm beyond the exterior edge. If additional fabric is needed to provide overlap at joints and wrap-around at edges, the added fabric shall overlap the fabric on the geocomposite drain at least 150 mm and be attached thereto.

Should the fabric on the geocomposite drain be torn or punctured, the damaged section shall be replaced completely or repaired by placing a piece of fabric that is large enough to cover the damaged area and provide a 150-mm overlap.

Plastic Pipe

Plastic pipe shall conform to the provisions for pipe for edge drains and edge drain outlets in Section 68-3, "Edge Drains," of the Standard Specifications.

Drainage Pads

Concrete for use in drainage pads shall be minor concrete, except the concrete shall contain not less than 300 kilograms of cement per cubic meter.

Treated Permeable Base At Bottom Of Geocomposite Drains

Treated permeable base to be placed around the slotted plastic pipe at the bottom of geocomposite drains shall conform to the provisions in "Treated Permeable Base Under Approach Slabs." If asphalt treated permeable base is used, it shall be placed at a temperature of not less than 82°C nor more than 110°C.

The filter fabric to be placed over the treated permeable base at the bottom of geocomposite drains shall conform to the provisions for filter fabric for edge drains in Section 88, "Engineering Fabrics," of the Standard Specifications.

ENGINEERING FABRICS

Filter fabric to be placed between the structure approach embankment material and the treated permeable base shall conform to the provisions for filter fabric for edge drains in Section 88, "Engineering Fabrics," of the Standard Specifications and these special provisions.

The subgrade to receive the filter fabric, immediately prior to placing, shall conform to the compaction and elevation tolerance specified for the material involved.

Filter fabric shall be aligned, handled, and placed in a wrinkle-free manner in conformance with the manufacturer's recommendations.

Adjacent borders of the filter fabric shall be overlapped from 300 to 450 mm or stitched. The preceding roll shall overlap the following roll in the direction the material is being spread or shall be stitched. When the fabric is joined by stitching, it shall be stitched with yarn of a contrasting color. The size and composition of the yarn shall be as recommended by the fabric manufacturer. The stitches shall number 5 to 7 per 25 mm of seam.

Equipment or vehicles shall not be operated or driven directly on the filter fabric.

Woven tape fabric shall be treated to provide a minimum of 70 percent breaking strength retention after 500 hours exposure when tested in conformance with the requirements in ASTM Designation: D 4355. The Contractor shall notify the Engineer, in writing, of the source of woven tape fabric at least 45 days prior to use.

TREATED PERMEABLE BASE UNDER APPROACH SLAB

Treated permeable base under structure approach slabs shall consist of constructing either an asphalt treated permeable base or a cement treated permeable base in accordance with Section 29, "Treated Permeable Bases," of the Standard Specifications and these special provisions.

The type of treatment, asphalt or cement, to be used shall be at the option of the Contractor.

Not less than 30 days prior to the start of placing the treated permeable base, the Contractor shall notify the Engineer, in writing, which type of treated permeable base will be furnished. Once the Contractor has notified the Engineer of the selection, the type to be furnished shall not be changed without a prior written request to do so and approval thereof in writing by the Engineer.

Asphalt treated permeable base shall be placed at a temperature of not less than 93°C nor more than 121°C. Material stored in excess of 2 hours shall not be used in the work.

Asphalt treated permeable base material may be spread in one layer. The base material shall be compacted with a vibrating shoe type compactor or rolled with a roller weighing not less than 1.3 tonnes nor more than 4.5 tonnes. Rolling shall begin as soon as the mixture has cooled sufficiently to support the weight of the rolling equipment without undue displacement.

Cement treated permeable base material may be spread in one layer. The base material shall be compacted with either a vibrating shoe type compactor or with a steel-drum roller weighing not less than 1.3 tonnes nor more than 4.5 tonnes. Compaction shall follow within one-half hour after the spreading operation and shall consist of 2-complete coverages of the treated material.

APPROACH SLABS

Concrete for use in approach slabs shall contain not less than 400 kilograms of cement per cubic meter.

Miscellaneous steel parts shall conform to the provisions in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications. Bar reinforcement that has an unbonded portion shall be galvanized in conformance with the provisions in Section 75-1.05, "Galvanizing," of the Standard Specifications.

Structure approach slabs shall be cured for not less than 5 days prior to opening to public traffic, unless, at the option of the Contractor, the structure approach slabs are constructed using concrete with a non-chloride Type C chemical admixture conforming to these special provisions.

Portland cement for use in concrete using a non-chloride Type C chemical admixture shall be Type II Modified, Type II Prestress, or Type III. Type II Modified and Type III cement shall conform to the provisions in Section 90-2.01, "Portland Cement," of the Standard Specifications. Type II Prestress cement shall conform to the requirements of Type II Modified cement, except the mortar containing the portland cement to be used and Ottawa sand, when tested in conformance with California Test 527, shall not contract in air more than 0.053-percent.

The non-chloride Type C chemical admixture, approved by the Engineer, shall conform to the requirements in ASTM Designation: C 494 and Section 90-4, "Admixtures," of the Standard Specifications.

The concrete with non-chloride Type C chemical admixture shall be prequalified prior to placement in conformance with the provisions for prequalification of concrete specified by compressive strength in Section 90-9.01, "General," of the Standard Specifications and the following:

- A. Immediately after fabrication of the 5 test cylinders, the cylinders shall be stored in a temperature medium of $21 \pm 1.5^{\circ}\text{C}$ until the cylinders are tested.
- B. The 6-hour average strength of the 5 test cylinders shall not be less than 5.85 MPa. No more than 2 test cylinders shall have a strength of less than 5.5 MPa.

The top surface of approach slabs shall be finished in conformance with the provisions in Section 51-1.17, "Finishing Bridge Decks," of the Standard Specifications. Edges of slabs shall be edger finished.

Approach slabs shall be cured with pigmented curing compound (1) in conformance with the provisions for curing structures in Section 90-7.01B, "Curing Compound Method," of the Standard Specifications.

Structure approach slabs constructed using concrete with a non-chloride Type C chemical admixture shall be cured for not less than 6 hours prior to opening to public traffic. The curing period shall be considered to begin at the start of discharge of the last truck load of concrete to be used in the slab.

If the ambient temperature is below 18°C during the curing period for approach slabs using concrete with a non-chloride Type C chemical admixture, an insulating layer or blanket shall cover the surface. The insulation layer or blanket shall have an R-value rating given in the table below. At the Contractor's option, a heating tent may be used in lieu of or in combination with the insulating layer or blanket.

Temperature range during curing period	R-value, minimum
13°C to 18°C	1
7°C to 13°C	2
4°C to 7°C	3

JOINTS

Hardboard and expanded polystyrene shall conform to the provisions in Section 51-1.12D, "Sheet Packing, Preformed Pads and Board Fillers," of the Standard Specifications.

Type AL joint seals shall conform to the provisions in Section 51-1.12F, "Sealed Joints" of the Standard Specifications. The sealant may be mixed by hand-held power-driven agitators and placed by hand methods.

The pourable seal between the steel angle and concrete barrier shall conform to the requirements for Type A and AL seals in Section 51-1.12F(3), "Materials and Installation," of the Standard Specifications. The sealant may be mixed by hand-held power-driven agitators and placed by hand methods. Immediately prior to placing the seal, the joint shall be thoroughly cleaned, including abrasive blast cleaning of the concrete surfaces, so that all foreign material and concrete spillage are removed from all joint surfaces. Joint surfaces shall be dry at the time the seal is placed.

MEASUREMENT AND PAYMENT

Structural concrete, approach slab (Type N) and structural concrete, will be measured and paid for in conformance with the provisions in Section 51-1.22, "Measurement," and Section 51-1.23, "Payment," of the Standard Specifications and these special provisions.

Full compensation for the structure approach drainage system including geocomposite drain, plastic pipe, drainage pads, treated permeable base, filter fabric, woven tape fabric, miscellaneous metal, pourable seals, bar reinforcement and miscellaneous bridge metal, , waterstops, and sliding joints shall be considered as included in the contract price paid per cubic meter for structural concrete, approach slab of the type shown in the Engineer's Estimate and no additional compensation will be allowed therefor.

10-1.48 BRIDGE DECK FINISH

The smoothness requirements of Section 51-1.17, "Finishing Bridge Decks," of the Standard Specifications shall not apply to the segmentally constructed portions of the deck of the new Benicia Martinez Bridge and OH (Frames 1 through 3) except as noted otherwise in this special provision. These portions of the bridge deck shall be finished, profiled and ground in accordance with the requirements of these special provisions and as directed by the Engineer.

Grinding existing Portland cement bridge decks on segmentally constructed portions of the deck shall conform to the provisions in Section 51-1.17, "Finishing Bridge Decks," of the Standard Specifications except as modified by these special provisions.

Attention is directed to "Preformed Inductive Loops" elsewhere in these special provisions. Grinding of the bridge deck shall not expose inductive loops.

Deck Finish-

The deck shall be finished in accordance with the requirements in "Segmentally Erected Superstructure " of these special provisions.

Smoothness Evaluation—

The Contractor shall provide a smoothness evaluation of the segmentally constructed portions of the completed bridge deck (including pier table areas at Piers 5 through 15) by a computerized California "Cox" type profilograph in accordance with the criteria herein and ASTM E 1274-88 (Reapproved 1993)e1. Profiling shall be performed by an independent

provider approved by the Engineer, using equipment calibrated in the presence of the Engineer and programmed to satisfy the smoothness criteria of these special provisions. The riding surfaces subject to this evaluation include all traffic lanes and both shoulders on the structure.

In addition to the requirements of ASTM E 1274, the computerized profilograph shall have the following minimum properties:

1. The profilograph shall consist of a 7.62m long rigid frame with the profile being recorded using a wheel located at the midpoint along the length between the end supporting wheels, the height reading accuracy shall be plus or minus 0.5mm.
2. The profilograph shall have digital recording and downloading capabilities.
3. The profilograph shall have automated interpretation for profile smoothing and profile index determination.
4. The profilograph shall have an audible must grind alert and shall locate both bumps and dips that exceed the height and depth requirements as specified herein.
5. The profilograph shall have custom programming capability and on-site control software upgrade capability; software shall allow multiple evaluations of a single profile run with different blanking band.
6. The profilograph shall have built in vertical measurement calibration using test blocks furnished with the unit.

The Contractor's independent profilographer shall first demonstrate that the profilograph's vertical measurement has been properly calibrated using the built in vertical calibration diagnostics and the pre-measured test blocks furnished with the profilograph by the manufacturer. Additional calibration of the actual profilograph to be used shall be made in the presence of the Engineer and shall consist of a single set of 5 runs of the profilograph on the same profile line on the bridge deck. The profile line shall be 100 meters long and shall be painted on the bridge deck so that the same path can be followed repeatedly. Calibration of the profilograph shall be deemed successful after both demonstrating vertical calibration and obtaining a profile index (on a per kilometer basis) for the five test runs that does not vary by more than 25mm between the five runs.

Smoothness Requirements—

The Profile Index Value (PIV) for the bridge deck in the direction of traffic will be averaged for the left and right wheel path of each lane and shall not exceed 150 mm per kilometer utilizing the 5.0 mm blanking band. These criteria will be applied to each 100 m of each lane. Individual bumps and depressions exceeding a cutoff height of 5.0 mm from a chord of 7.5 m (see ASTM E-1274) on the profilograph trace shall be corrected. Where the maximum grinding depths limit the correction of a scallop or dip, the dip shall be corrected by the placement of polyester concrete as specified herein. In addition, the driving surface shall not vary more than 6 mm from the lower edge of a 3.6-m \pm 0.06-m long straightedge placed transversely to traffic. The Contractor shall provide additional profilograph testing as necessary following longitudinal planing and any other actions taken to improve smoothness, until a profile meeting or exceeding the acceptance criteria is obtained.

Smoothness Incentive—

At the Contractor's option, an incentive is offered for achieving a smoother profile, on the segmentally constructed portions of the completed bridge, than the 150 mm per kilometer profile index value. Contract unit price adjustments will be made in accordance with the following table:

Average Profile Index Value(mm/km)	Contract Lump Sum Price Adjustments
Per 0.1-km Section	Percentage of Grind Bridge Deck Lump Sum Bid Price
PIV<50	103
PIV>50, PIV<100	102
PIV>100, PIV<125	101
PIV>125, PIV<150	100
PIV>150	Not acceptable, Corrective work required

Pay adjustments will be made based on the average profile index measured after completion of grinding. The pay adjustment will be prorated based on every 0.1 km where the PIV is less than 150 mm.

Deck Grinding and Planing—

The entire bridge deck and concrete approach slab surfaces shall be longitudinally planed using a self-propelled grinding machine with gang mounted diamond saw cutting blades specifically designed for such work. The intent of this specification is 100% texture grinding of the entire deck area, but minor depressions (un-ground areas) will be allowed if grinding on

either side of the depression (scallop) will require more than 25mm of concrete removal. The grinding machine shall have minimum wheel base length of 4.57 m, and shall be constructed and operated in such manner that it does not cause strain or damage to the deck surface, excessive ravels, aggregate fractures or spalling. The equipment shall be approved by the Engineer. Planing shall be longitudinal and parallel to the roadway centerline, and shall provide a consistent, textured surface that will meet or exceed the profilograph smoothness criteria. The Contractor shall control the work such that removal by all passes of the longitudinal planing equipment and any other grinding (to remove localized high spots) does not exceed a maximum depth of 25mm. The minimum planing depth shall be that required to texture the surface.

After planing, the pavement smoothness shall be reevaluated using the profilograph testing described above. The Contractor shall perform additional retesting with the same equipment if further corrective measures are necessary. If the Contractor is unable to obtain the smoothness requirements of these special provisions for any stretches of the segmentally constructed portions of the structure, the Contractor shall grind or shotblast the top deck cover down to a uniform thickness of 65mm over the reinforcing steel and then place a 19mm minimum thick polyester concrete overlay in accordance with the requirements herein.

The Engineer may perform profilograph testing for monitoring and comparison purposes. The Engineer may test the entire bridge if it is determined that the Contractor's independent provider test results are inaccurate. In this case, additional inspection and equipment expenses will be sustained by the State and payment to the Contractor for deck grinding will be reduced at a rate of \$200/kilometer, per profile track line, with a minimum charge of \$800.

Construction Methods

The Contractor's equipment shall continuously vacuum the area of the deck being ground and shall collect the water and grindings for later disposal. The deck surface shall be swept and cleaned of all slurry/debris generated during this work concurrently with operation of the machine. All debris generated during deck grinding shall become the property of the Contractor and shall be removed and disposed of as provided in Section 7-1.13, "Disposal of Material Outside the Right of Way," of the Standard Specifications.

The Contractor shall utilize grinding machines which can grind to within at least 150 mm of the bottom edge of the concrete barriers. The area between the closest grinding pass to the barriers and the barrier shall be taken down or feathered by smaller hand operated grinding machines such that all lips are eliminated and so that water drains freely to the deck drains without pooling or standing. The Contractor's attention is directed to the need to set the drainage box frames low so that necessary profile grinding near the edges of deck can be accomplished.

Optional Polyester Concrete Overlay

At the Contractor's option, a polyester concrete overlay may be substituted for the integral thickness and mandatory full grinding shown on the plans and specified in these special provisions. The smoothness requirements contained herein shall still apply when the optional polyester concrete overlay is chosen.

At the Contractor's option, subject to the approval of the Engineer, the Contractor may elect to reduce the deck slab thickness shown on the plans on the segmentally constructed portions of the bridge deck and place a polyester concrete overlay. The deck slab reduction shall be made in the cover provided on the top mat of reinforcing. The deck thickness on the segmentally constructed portions of the deck shall be reduced by 25mm maximum. A 19mm minimum thick layer of polyester concrete shall be placed for the full length of the segmentally constructed portions of the bridge. Polyester concrete shall not be placed thicker than 40mm without approval of the Engineer.

This work of constructing a polyester concrete overlay shall conform to these special provisions. Attention is directed to the design calculations which must be submitted by the Contractor as required in "Segmentally Erected Superstructure" of these special provisions. The design calculations shall reflect the Contractor's choice of using a polyester concrete overlay before an overlay will be permitted.

Before starting deck overlay work on the project, the Contractor shall submit, for approval by the Engineer, a program for public safety associated with use of methacrylate resin and polyester concrete during the construction of the project. Such program shall identify materials, equipment and methods to be used. The Contractor shall not perform any deck overlay work on the project, other than that specifically authorized in writing by the Engineer, until such program has been approved.

If the measures being taken by the Contractor are inadequate to provide for public safety associated with use of methacrylate resin and polyester concrete, the Engineer will direct the Contractor to revise his operations and his public safety program. Such directions will be in writing and will specify the items of work for which the Contractor's program for public safety associated with use of methacrylate resin and polyester concrete are inadequate. No further work shall be performed on these items until the public safety measures are adequate and, if required, a revised program for public safety associated with use of methacrylate resin and polyester concrete has been approved.

The Engineer will notify the Contractor in writing of the approval or rejection of any submitted or revised program for public safety associated with use of methacrylate resin and polyester concrete in not more than 10 working days following submittal.

The State will not be liable to the Contractor for failure to approve all or any portion of an originally submitted or revised program for public safety associated with use of methacrylate resin and polyester concrete, nor for any delays to the work due to the Contractor's failure to submit an acceptable program for public safety associated with use of methacrylate resin and polyester concrete.

A certified industrial hygienist will furnish an airborne emissions monitoring plan. The emissions will be monitored at a minimum of 4 points including the point of mixing, application, and the point of nearest public contact, as determined by the Engineer. At the completion of work, a report by the certified industrial hygienist with results of the airborne emissions monitoring plan shall be furnished to the Engineer. The airborne emissions monitoring work, including planning, monitoring and reporting, performed by the certified industrial hygienist will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

Surface preparation prior to placing the polyester concrete shall be as follows:

The existing lightweight concrete deck surface shall be prepared and cleaned by using steel shot-blasting and then blowing clean the deck surface, as described in these special provisions.

Shotblasting machines shall be rated for a minimum of 195 kilowatt per meter of cutting width.

All laitance and surface contaminants including, but not limited to rust, oil, paint, joint material, and other foreign material shall be cleaned from the surface of the existing concrete deck.

If the surface becomes contaminated at any time prior to placing the primer for the overlay, the surface shall be cleaned by abrasive blasting.

Equipment shall be fitted with suitable traps, filters, drip pans or other devices, as necessary, to prevent oil or other deleterious material from being deposited on the deck.

Equipment or procedures that leave fractured aggregate or otherwise damage the concrete surface which is to remain shall not be used.

All removed materials shall become the property of the Contractor and shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

A prime coat shall be applied to the surfaces to be covered with polyester concrete.

Polyester concrete shall consist of polyester resin binder and dry aggregate. The resin shall be an unsaturated isophthalic polyester-styrene co-polymer conforming to the following:

POLYESTER RESIN BINDER		
PROPERTY	REQUIREMENT	TEST METHOD
* Viscosity	0.075 to 0.20 Pa·s (RVT, No. 1 Spindle, 20 RPM at 25°C)	ASTM D 2196
* Specific Gravity	1.05 to 1.10 at 25°C	ASTM D 1475
Elongation	35 percent, minimum Type I at 11.5 mm/min. Thickness= 6.5±1 mm	ASTM D 638
	Sample Conditioning: 18/25/50 + 5/70	ASTM D 618
Tensile Strength	17.5 MPa, minimum Type I at 11.5 mm/min. Thickness= 6.5±1 mm	ASTM D 638
	Sample Conditioning: 18/25/50 + 5/70	ASTM D 618
* Styrene Content	40 percent to 50 percent (by weight)	ASTM D 2369
Silane Coupler	1.0 percent, minimum (by weight of polyester styrene resin)	
PCC Saturated Surface-Dry Bond Strength	3.5 MPa, minimum at 24 hours and 21±1°C	California Test 551
* Static Volatile Emission	60 gram per square meter, loss, maximum	South Coast Air Quality Management District, Standard Method
* Test shall be performed prior to adding initiator.		

The silane coupler shall be an organosilane ester, gammamethacryloxypropyltrimethoxy-silane. The promoter shall be compatible with suitable methyl ethyl ketone peroxide (MEKP) and cumene hydroperoxide (CHP) initiators.

Aggregate for polyester concrete shall conform to the provisions in Section 90-2.02, "Aggregates," of the Standard Specifications and either of the following combined aggregate gradings:

COMBINED AGGREGATE		
Sieve Size	9.5-mm Max. Percent Passing	4.75-mm Sieve Max. Percent Passing
12.5-mm	100	100
9.5-mm	83 - 100	100
4.75-mm	65 - 82	62 - 85
2.36-mm	45 - 64	45 - 67
1.18-mm	27 - 48	29 - 50
600-μm	12 - 30	16 - 36
300-μm	6 - 17	5 - 20
150-μm	0 - 7	0 - 7
75-μm	0 - 3	0 - 3

Aggregate retained on the 2.36-mm sieve shall have a maximum of 45 percent crushed particles when tested in conformance with California Test 205. Fine aggregate shall consist of natural sand only.

Aggregate absorption shall not exceed one percent as determined by California Test 206 and 207.

At the time of mixing with the resin, the moisture content of the aggregate, as determined by California Test 226, shall not exceed one half of the aggregate absorption.

The prepared surface shall receive a wax-free, low odor, high molecular weight methacrylate prime coat. The prime coat shall be a resin, and prior to adding initiator the resin shall have a maximum volatile content of 30 percent, when tested in conformance with the requirements in ASTM Designation: D 2369, and conforming to the following:

High Molecular Weight Methacrylate (HMWM) Resin		
PROPERTY	REQUIREMENT	TEST METHOD
* Viscosity	0.025 Pa·s, maximum, (Brookfield RVT with UL adaptor, 50 RPM at 25°C)	ASTM D 2196
* Specific Gravity	0.90, minimum, at 25°C	ASTM D 1475
* Flash Point	82°C, minimum	ASTM D 3278
* Vapor Pressure	1.0 mm Hg, maximum, at 25°C	ASTM D 323
Tack-free time	400 minutes, maximum at 25°C	California Test 551
PCC Saturated Surface-Dry Bond Strength	3.5 MPa, minimum at 24 hours and 21±1°C	California Test 551
* Test shall be performed prior to adding initiator.		

The promoter/initiator system for the methacrylate resin shall consist of a metal drier and peroxide. If supplied separately from the resin, at no time shall the metal drier be mixed with the peroxide directly. The containers shall not be stored in a manner that will allow leakage or spillage from one material to contact the containers or material of the other.

A Material Safety Data Sheet shall be furnished prior to use for each shipment of polyester resin binder and high molecular weight methacrylate resin.

The Contractor shall allow 14 days for sampling and testing of the polyester resin binder and high molecular weight methacrylate resin prior to proposed use.

If bulk resin is to be used, the Contractor shall notify the Engineer in writing 10 days prior to the delivery of the bulk resin to the jobsite. Bulk resin is any resin that is stored in containers in excess of 209 liters.

Joint seal assemblies shall be set to the anticipated grade of the polyester concrete at the time of pouring the closure pours which fix their elevation. At joint seal assemblies, the polyester concrete shall be finished flush with the top of the assemblies. Joint seal assemblies and drainage boxes shall be covered and protected while placing the polyester concrete. Prior to applying the prime coat, the area to receive the prime coat shall be dry and blown clean by compressed air to remove accumulated dust and any other loose material. The surface temperature shall be at least 10°C when the prime coat is applied.

The prime coat shall be uniformly applied to completely cover the surface to receive the polyester concrete. The rate of spread shall be approximately 1.5 square meter per liter.

The prime coat shall be allowed to cure a minimum of 15 minutes before placing polyester concrete. If the primed surface becomes contaminated, the contaminated area shall be cleaned by abrasive blasting and reprimed at the Contractor's expense.

Polyester concrete shall be placed within 120 minutes after the prime coat has been applied.

Polyester concrete shall be mixed in mechanically operated mixers. Mixer size shall be limited to a 1/4 cubic meter capacity, unless approved by the Engineer. The polyester resin binder in the concrete shall be approximately 12 percent by weight of the dry aggregate; the exact percentage will be determined by the Engineer.

A continuous mixer, employing an auger screw/chute device, may be approved for use by the Engineer upon demonstrating its ability to produce a satisfactory product. The continuous mixer shall 1) be equipped with a metering device that automatically measures and records the aggregate volumes and the corresponding resin volumes and 2) have a readout gage, visible to the Engineer at all times, that displays the volumes being recorded. The volumes shall be recorded at no greater than 5-minute intervals along with the time and date of each recording. A printout of the recordings shall be furnished to the Engineer at the end of each workshift.

The amount of initiator used in polyester concrete shall be sufficient to produce initial set time between 30 and 120 minutes during placement. The initial set time will be determined by using an initial-setting time Gillmore needle in conformance with the requirements of ASTM Designation: C 266. Accelerators or inhibitors may be required to achieve proper set times and shall be used as recommended by the resin supplier.

The resin binder shall be initiated and thoroughly blended just prior to mixing with aggregate. The polyester concrete shall be mixed a minimum of 2 minutes prior to placing.

Polyester concrete shall be placed prior to gelling and within 15 minutes following addition of initiator, whichever occurs first. Polyester concrete that is not placed within this time shall be discarded.

The surface temperature of the area to receive polyester concrete shall be the same as specified above for the prime coat. The finishing equipment used shall strike off the polyester concrete to the established grade and cross section. Finishing equipment shall be fitted with vibrators or other means of consolidating the polyester concrete to the required compaction.

The polyester concrete shall be consolidated to a relative compaction of not less than 97 percent in conformance with tentative California Test 552.

The finished surface of the polyester concrete overlay shall conform to the provisions in Section 51-1.17, "Finishing Bridge Decks," of the Standard Specifications and these special provisions.

Polyester concrete surfaces shall receive a longitudinally tined finish. Surface tining will be linked directly to the finishing machine and become a part of the integral finishing operation. The tining pattern shall match that as specified for grooving in the second paragraph of Section 42-1.02, "Construction" of the Standard Specifications. A light surface sanding will also be required. The sand will be used to saturate areas where excess resin has bled through to the surface. The sand shall be commercial quality blast sand conforming to the quality and dryness requirements for polyester concrete aggregate as specified in these special provisions. Ninety-five percent of the sand shall pass the 2.36-mm sieve, and 95 percent shall be retained on the 850-µm sieve. The surface texture of polyester concrete surfaces shall be uniform and shall have a coefficient of friction of not less than 0.35 as measured by California Test 342. Any portions of surfaces that do not meet the above provision shall be grooved in conformance with the provisions of Section 42, "Groove and Grind Pavement," of the Standard Specifications until the above tolerance is met.

Traffic and equipment shall not be permitted on the overlay for a minimum of 4 hours following final finishing. Overlays shall be protected from moisture for not less than 4 hours after finishing.

Prior to constructing the overlay, one or more trial overlays shall be placed on a previously constructed lightweight concrete base to determine the initial set time and to demonstrate the effectiveness of the mixing, placing, and finishing equipment proposed. The lightweight concrete base shall not be part of the final construction and shall be constructed using the approved lightweight concrete mix design to be used in the bridge. Each trial overlay shall be 3.6 m wide, at least 1.8 m long, and the same thickness as the overlay to be constructed on the bridge. Conditions during the construction of the overlay and equipment used shall be similar to those expected and to be used for the construction of the polyester concrete overlay. The trial overlay shall be tested in accordance with Appendix A of ACI 503. A minimum of 10-50mm discs shall be tested at random locations selected by the Engineer. All tests shall show failure of the concrete only (cohesive concrete failure). If any of the tests show separation within the overlay or separation of the overlay from the concrete substrate, the trial overlay shall be repeated after making corrections to the procedures and materials. Production placement shall not begin until the trial overlay testing has been successfully completed.

All materials used in the trial overlays, including the concrete base shall become the property of the Contractor and shall be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Right of Way," of the Standard Specifications.

Payment—

The contract lump sum price paid for grind bridge deck shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in constructing the polyester concrete overlay (if used), complete in place, including cleaning and preparing the deck by shot blasting, application of prime coat and furnishing, constructing and disposing of trial overlays and base, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for compliance with the requirements for a program for public safety associated with use of methacrylate resin and polyester concrete shall be considered as included in the contract lump sum price paid for grind bridge deck and no additional compensation will be allowed therefor.

Full compensation for the surface preparation required for polyester concrete shall be considered as included in the contract lump sum price paid for grind bridge deck and no separate payment will be made therefor. No payment will be made for prepare concrete bridge deck surface.

The contract lump sum price paid for grind bridge deck shall include full compensation for furnishing all labor, materials, equipment, and incidentals and for doing all the work involved in profile grinding and cleaning of the bridge deck, as specified in the Standard Specifications and these special provisions and as directed by the Engineer.

10-1.49 TEST BLOCKS

Test blocks shall be constructed in accordance with the details shown on the plans and the requirements of these special provisions.

The intent of the test blocks is to verify the Contractor's prestressing system within the superstructure, confirm the Contractor's additional prestress anchorage zone reinforcement is compatible with the prestress anchorages and lightweight concrete, to allow the Contractor an opportunity to demonstrate portions of the segment construction and to adjust his procedure of production if it proves necessary. The Contractor's attention is directed to the additional requirements for qualifying prestressing systems, both bar and strand systems, in lightweight concrete in "Prestressing Concrete" elsewhere in these special provisions.

Test blocks shall be constructed a minimum of 2 months before the first actual superstructure segment is placed. All prequalification of the prestressing system, including post tensioning anchorage systems prequalification testing, in accordance with "Prestressing Concrete" of these special provisions, shall have been completed prior to submitting any working drawings for the segment test blocks.

Materials and Construction

All materials used to construct the test blocks shall be the same as those to be used in the actual construction of the cantilever segments. For example, the lightweight concrete to be used shall be the approved mix for use in the actual bridge, as shall be the anchorages, jacks and duct materials. The Contractor shall include all typical segment details shown elsewhere in the plans including but not limited to: electrical conduits, inserts and imbeds, pullboxes, and empty ducts for future anchorages. The Contractor shall take special care to involve all subcontractors who will be involved with the actual bridge construction in the preparation of the test blocks and to use only materials and equipment that are representative of what will actually be used during construction of the cantilever portions of the bridge.

The Contractor shall utilize an actual form from one of the form travelers to cast the test blocks.

The Contractor shall notify the engineer 2 weeks prior to constructing test blocks. Test blocks shall be continuously inspected by the Engineer as they are assembled and written approval by the Engineer that the test blocks conform to the working drawings shall be obtained prior to placing lightweight concrete into the forms. Any changes from the working drawings shall be brought to the Engineer's attention prior to placing concrete into the test block forms.

Lightweight concrete cylinders shall be taken in accordance with "Lightweight Concrete" of these special provisions. Cylinders shall be broken just prior to stressing. Stressing of the longitudinal and transverse tendons shall be in accordance with the Contractor's proposed segment casting schedule. That is, the concrete age at stressing since the time of casting shall be the same as that proposed in the Contractor's segment construction schedule.

It is recommended, but not mandatory, that if the Contractor plans to pump the lightweight concrete during construction of the bridge, that lightweight concrete for the test blocks be pumped through a similar length of pump hose with a similar head (vertical elevation change).

Transverse tendons in the Cantilever Tendon Test Block shall be stressed prior to stressing the longitudinal tendons. Blank ducts shall remain ungrouted as shown on the test block plans.

Working Drawings

Working drawings for the test blocks shall be submitted. The working drawings shall be submitted for review to the Resident Engineer's Office, for approval in accordance with the provisions in Section 5-1.02, "Plans and Working Drawings". For initial review, 5 sets shall be submitted. After review, between 6 and 12 sets, as requested by the Engineer, shall be submitted to said Office for final approval and for use during construction of the test blocks.

The time to be provided for the Engineer's review of the working drawings for the test blocks, shall be as 6 weeks.

As a minimum, working drawings to be submitted shall include a single coordinated package, indexed and tabbed with complete information on: form layout, prestressing tendon layout, jacking procedures, bar reinforcing lists, concrete placement schematics and schedules (including concrete deliver methods), location of all typical electrical conduits, inserts and imbeds, pullboxes, and empty ducts for future anchorages, holes for form traveler attachments, stripping details, support details after stripping and during jacking, and curing methods.

Payment

The contract lump sum price paid for test blocks shall include full compensation for furnishing all labor, materials, equipment, and incidentals and for doing all the work involved in constructing the test blocks, including submittal of working drawings, as specified in the Standard Specifications and these special provisions and as directed by the Engineer.

If in the opinion of the Engineer, significant cracking of either of the test blocks occurs as the result of the Contractor's prestressing system, the Contractor shall revise the prestressing system and shall construct either one or both of the test blocks again, without cost to the State, until successful results are obtained.

10-1.50 SEALING JOINTS

Joints in concrete bridge decks and joints between concrete structures and concrete approach slabs shall be sealed in conformance with the details shown on the plans, the provisions in Section 51, "Concrete Structures," of the Standard Specifications, and these special provisions.

When ordered by the Engineer, a joint seal larger than called for by the Movement Rating shown on the plans shall be furnished and installed. Payment to the Contractor for furnishing the larger seal and for saw cutting the increment of additional depth of groove required will be determined as provided in Section 4-1.03, "Changes," of the Standard Specifications.

10-1.51 JOINT SEAL ASSEMBLIES (MOVEMENT RATING EXCEEDING 100 mm)

Joint seal assemblies with movement ratings greater than 100 mm shall consist of a metal frame system, supporting rails and support bars with intervening neoprene glands and shall conform to the details shown on the plans, the provisions in Section 51, "Concrete Structures," of the Standard Specifications and to these special provisions.

Attention is directed to "Integrated Drawings" of these special provisions.

Joint seal assemblies will not be considered for approval without satisfactory evidence that the assemblies have had at least one year of satisfactory service under conditions similar to this application.

A qualified representative of the manufacturer shall be present during installation of the first assembly and shall be available for advice during any remaining installations.

The Contractor shall submit complete working drawings for each joint seal assembly to the Resident Engineer's Office in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. The working drawings shall show complete details of the joint seal assembly and anchorage components and the method of installation to be followed, including requirements for storage of the joint, details of support for the joint during shipping and handling, concrete blockout details and any additions or rearrangements of the reinforcing steel from that shown on the plans. For initial review, 5 sets of drawings shall be submitted. After review, between 6 and 12 sets, as requested by the Engineer, shall be submitted to the Resident Engineer's Office for final approval and use during construction.

The working drawings shall be supplemented with complete calculations and a Repair and Maintenance manual for the particular joint seal assembly. Design calculations shall be included for all structural elements including springs and bearings. The Repair and Maintenance Manual shall include a description of replacement of parts subject to wear in the design, including a list of parts and instructions for maintenance inspection, acceptable wear tolerances, methods determining wear, procedures for replacing worn parts and procedures for removing and replacing watertight seals. Working drawings shall include details of factory attached lifting devices, prestressing hardware and brackets to facilitate field handling and thermal adjustments including instructions for mechanically opening and closing of the joint seal assemblies. Working drawings shall be either 279 mm x 432 mm or 559 mm x 864 mm in size and each drawing and calculation sheet shall include the State assigned designations for the contract number, bridge number, full name of the structure as shown on the contract plans, and District-County-Route-Kilometer Post. The design firm's name, address, and phone number shall be shown on the working drawings. Each sheet shall be numbered in the lower right hand corner and shall contain a blank space in the upper right hand corner for future contract sheet numbers.

Calculations and working drawings shall be stamped and signed by an engineer who is registered as a Civil Engineer. The Contractor shall allow the Engineer 4 weeks to review the drawings after a complete set has been received.

Within 3 weeks after final working drawing approval, one set of the corrected good quality prints on 75-g/m² (minimum) bond paper (559 mm x 864 mm in size) of all working drawings prepared by the Contractor for each joint seal assembly shall be furnished to OSD.

Each shipment of joint seal assembly materials shall be accompanied by a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The certificate shall state that the materials and fabrication involved comply in all respects to the specifications and data submitted in obtaining approval. In addition, a manufacturer's Certificate of Compliance with the AISC Quality Certification Program (AISC Simple Structure Category shop approval) shall be submitted. Including certification that welding inspection personnel are qualified and certified as welding inspectors under AWS QC1, Standard for Qualification and Certification of Welding Inspectors.

The neoprene glands shall conform to the requirements in Table 1 of ASTM Designation: D 2628 and the following, except that no recovery tests or compression-deflection tests will be required:

Property	Requirement	ASTM Method	Test
Hardness, Type A Durometer, points	55-70	D (Modified)	2240
Compression set, 70 hours at 100°C, maximum, percent	40	D Method B (Modified)	395

All metal parts of the joint seal assembly shall conform to the provisions in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications. Bolts, nuts and washers shall conform to the requirements of ASTM Designation: A 325 or A 325M. At the Contractor's option, metal parts may conform to the requirements of ASTM Designation: A 572/A 572M or A709, Grade 50.

The joint seal assemblies shall be fabricated with permanent steel formwork shall be welded between the support boxes from the bottom of the edge beam to the same elevation as the bottom of the support boxes.

At the Contractor's option, cleaning and painting of all new metal surfaces of the joint seal assembly, except stainless steel and anchorages embedded in concrete, may be substituted for galvanizing. Cleaning and painting shall be in conformance with the provisions in Sections 59-2, "Painting Structural Steel," and 91, "Paint," of the Standard Specifications, and "Clean and Paint Structural Steel" of these special provisions.

Conformance with the requirements in SSPC-QP 1, SSPC-QP 2, and SSPC-QP 3 of the "SSPC: The Society for Protective Coatings" will not be required for joint seal assemblies.

Finish coats will not be required on joint seal assemblies.

If the assembly consists of more than one component, the design of the assembly shall be such that the external components can be removed and reinstalled at any position, within the larger one-half of the movement rating shown on the plans, to permit the inspection of the internal components of the assembly.

Except for components in contact with the tires, the assembly and its components shall be designed to support the AASHTO HS20-44 loading with 100 percent impact. Each component in contact with the tires shall support a minimum of 80 percent of the AASHTO HS20-44 loading with 100 percent impact. The tire contact area used to distribute the tire loads shall be 244 mm, measured normal to the longitudinal axis of the assembly, by 508 mm wide. The assembly shall provide a smooth riding joint without slapping of components or wheel tire rumble.

The movement rating of the assembly shall be measured normal to the longitudinal axis of the assembly. The dimensions for positioning the assembly within the movement rating during installation shall be measured normal to the longitudinal axis, disregarding any skew of the deck expansion joint. The assembly shall be capable of adjustment to the "a" dimension shown on the plans. The "a" dimensions shown on the plans for the various joints were calculated using a mean temperature of 21°C, and will require adjustment for an ambient temperature different from the assumed mean temperature at the time of installation using the factor "c" as shown on the plans.

The Contractor's joint seal assembly calculations shall include the maximum and minimum range of movement of the joint over the 100 year design life of the structure versus time. The Contractor's attention is directed to the need to use appropriate creep and shrinkage values in these calculations for the lightweight concrete portions of the structure, based on the Contractor's approved and tested mix designs, as well as to incorporate the Contractor's chosen construction sequence. The date of anticipated joint installation with respect to the approved construction schedule at each hinge or abutment shall be clearly stated in the calculations and the calculations shall be resubmitted should the anticipated installation date change from the approved schedule by more than one month.

The joint seal assemblies shall be designed and manufactured under an established and maintained Quality Assurance Program. The QA Program shall including written process specifications and procedures to ensure that the design, manufacturing, inspection, and testing activities are accomplished in accordance with the approved system. The QA Program

shall be based on one of the following three programs, an alternate program may be considered acceptable after review and approval by the Engineer:

1. ISO 9001
2. MIL-Q-9858A
3. MIL-I-45208A

In addition to the minimum requirements established by the selected QA Program, the following Manufacturing Process Control requirements must be met by the job specific quality system in place:

1. Structural material traceability
2. Special process certification traceability
- 3 Detailed manufacturing drawings with revision levels
4. Written inspection instructions
5. Written component level process instructions

The maximum width of unsupported or yielding components or grooves in the roadway surface of the assembly, measured in the direction of vehicular traffic, shall be 75 mm for service level movements (shrinkage, creep and thermal). The number glands in the joint seal assembly shall be determined by dividing the MR shown on the plans by 75mm.

The bridge deck surface shall conform to the provisions in Section 51-1.17 "Finishing Bridge Deck," of the Standard Specifications or the requirements of these special provisions prior to placing joint seal assemblies and anchorage.

The assembly shall be completely shop-assembled and placed in a blocked out recess in the concrete deck surface. The depth and width of the recess shall permit the installation of the assembly anchorage components or anchorage bearing surface to the planned line and grade.

All reinforcement other than primary reinforcement shall continue through the recess construction joint into the recess and engage the anchorage components of the assembly.

The vertical expansion joint in barrier shall be available for inspection after placement of the recess concrete around the anchorage components of the assembly.

The assembly shall make a watertight, continuous return 150 mm up into the barrier at the low side of the deck joint. Neoprene glands shall be continuous without field splices or joints, including the return up into barrier.

Full compensation for any additional materials or work required because of the application of the optional cleaning and painting, for submitting complete calculations and resubmitting calculations when the installation date varies from the approved schedule, and for providing a different "a" dimension at the hinges, as directed by the Engineer shall be considered as included in the contract price paid per linear meter for the joint seal assembly involved, and no additional compensation will be allowed therefor.

10-1.52 PTFE SPHERICAL BEARING

PTFE spherical bearings, consisting of polytetrafluoro-ethylene (PTFE) and stainless steel bearing surfaces, structural steel plates and anchors shall conform to the details shown on the plans and these special provisions.

Attention is directed to "Integrated Drawings" of these special provisions.

PTFE spherical bearings shall be :

- A. Expansion type with spherical and sliding bearing surfaces.

The manufacturer of the PTFE spherical bearings shall show evidence that PTFE spherical bearings furnished by the same manufacturer and used in conditions similar to this application have had at least 3 years of satisfactory service at each of 2 projects.

A qualified representative of the manufacturer shall be present during installation of the first bearing and shall be available for advice during any remaining installations.

The Contractor shall submit to the Resident Engineer's Office for approval in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," working drawings of the PTFE spherical bearings. For initial review, 4 sets shall be submitted . After review, between 6 and 12 sets, as requested by the Engineer, shall be submitted to the Resident Engineer's Office for final approval and for use during construction.

The working drawings for PTFE spherical bearings shall include a description of the method of mechanical interlocking of the PTFE fabric to the metallic substrate and details of temporary support for the PTFE bearing sole plate during concrete placement.

Working drawings shall be 279 mm x 432 mm or 559 mm x 864 mm in size and each drawing and calculation sheet shall include the name of the structure as shown on the contract plans, District-County-Route, bridge number, and contract number.

Working drawings shall be submitted sufficiently in advance of the start of the affected work to allow time for review by the Engineer and correction by the Contractor of the drawings without delaying the work. Such time shall be proportional to the complexity of the work but in no case shall such time be less than 6 weeks after complete drawings and all support data are submitted.

At the completion of each structure on the contract, one set of reduced prints on 75-g/m² (minimum) bond paper, 279 mm x 432 mm in size, of the corrected original tracings of all working drawings for each structure shall be furnished to the Engineer. Reduced prints of drawings which are common to more than one structure shall be submitted for each structure. An index prepared specifically for the drawings for each structure containing sheet numbers and titles shall be included on the first reduced print in the set for each structure. Reduced prints for each structure shall be arranged in the order of drawing numbers shown in the index.

The edge of the corrected original tracing image shall be clearly visible and visually parallel with the edges of the page. A clear, legible symbol shall be provided as near to the upper left side of each page as is feasible within the original print to show the amount of reduction and a horizontal and vertical scale shall be provided on each reduced print to facilitate enlargement to original scale.

PTFE spherical bearings shall be installed on surfaces prepared in conformance with the provisions in Section 55-3.19, "Bearings and Anchorages," of the Standard Specifications.

The manufacturer shall furnish certificates of compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for all material used in the PTFE spherical bearings. The certification shall be supported by a copy of the results of all proof tests performed on the bearings.

PTFE surfaces of PTFE spherical bearings shall be unfilled PTFE fabric made from virgin PTFE oriented multifilament and other fibers. The resin in the filaments shall be virgin PTFE material (not reprocessed) in conformance with the requirements of ASTM Designation: D 1457.

At the highest point of substrate and after compression, the PTFE fabric shall have a minimum thickness of 1.6 mm and a maximum thickness of 3.2 mm.

Flat stainless steel surfaces shall be a weld overlay on structural steel plate, or solid or sheet stainless steel conforming to the requirements of ASTM Designation: A 240, Type 316 with a minimum thickness of 1.5 mm.

Curved stainless steel surfaces shall be solid stainless steel conforming to the requirements of ASTM Designation: A 240, Type 316..

Curved stainless steel surfaces with dimensions shown on the plans exceeding 101.6 mm in thickness shall be either a weld overlay on structural steel plate or solid stainless steel conforming to the requirements of ASTM Designation: A 240, Type 316.. Stainless steel sheet will not be allowed.

When a weld overlay is used for stainless steel surfacing, the overlay shall be placed by submerged arc welding using Type 309L electrodes. The finished overlay shall have a 2.38 mm minimum thickness after welding, grinding and polishing. Prior to welding, the manufacturer must submit a complete weld procedure specification (WPS) with the supporting procedure qualification record (PQR) to the Engineer for approval.

When stainless steel sheets are used for stainless steel surfacing, the sheets shall be attached by perimeter arc welding using Type 309L electrodes. After completion of the weld operation, the stainless steel surface shall be smooth and free from waves.

Structural steel plates, except stainless steel, shall conform to the requirements of ASTM Designation: A 709/A 709, Grade 36 [250], 50 [345], or 50W [345W].

Welding shall conform to the requirements of ANSI/AASHTO/AWS D1.5. Welding of stainless steel shall conform to the requirements of ANSI/AASHTO/AWS D1.6.

Convex plate radius dimension tolerances shall be 0.000 to -250 μ m. Concave plate radius dimensions shall be +250 to 0.000 μ m.

The bearing manufacturer shall have full size convex and concave metal templates for the 2 spherical surfaces of each bearing radius. The templates shall be available to the inspector during all bearing inspections.

The PTFE fabric on spherical or sliding bearing surfaces shall be epoxy bonded and mechanically interlocked to the steel substrate. All bonding shall be done under controlled factory conditions. The mechanical interlock on the spherical concave surface must be integrally machined into the steel substrate. Welded retention grids will not be allowed on the concave surface. Any edges, other than the selvage shall be oversown or recessed so that no cut fabric edges are exposed.

After completion of the bonding operation the PTFE surface shall be smooth and free from bubbles.

The surface of the bearing elements shall be controlled such that upon completion of the bearing assembly the PTFE to stainless steel interface shall be in full bearing.

The mating surface of the stainless steel with the PTFE surfacing shall have a polished surface finish of less than 0.5 μ m root-mean-square (rms), determined in conformance with the requirements in ANSI Standard B46.1.

Metal surfaces of bearings exposed to the atmosphere in the completed work, except stainless steel surfaces shall be cleaned and painted in conformance with the provisions in Sections 59-2, "Painting Structural Steel," and 91, "Paint" of the Standard Specifications, and "Clean and Paint Structural Steel" of these special provisions.

Finish coats will not be required on the bearings.

PTFE spherical bearing assemblies shall be assembled at the factory. Each assembly shall have a minimum of 4 temporary steel straps which are bolted to threaded holes in the masonry and sole plates so that the entire assembly is shipped as a unit and remains intact when uncrated and installed. Welding of the steel straps will not be allowed. Straps must be adequate for vertical lifting purposes. Bearing dismantling will only be allowed under the direction and in the presence of the Engineer.

During fabrication, the maximum temperature of bonded PTFE surfaces shall be 150°C.

Damaged bearings and bearings with scratched mating surfaces shall be replaced or resurfaced.

PTFE spherical bearing sole plates shall be temporarily supported during concrete placement. Temporary supports shall prevent the rotation or displacement of the bearing during concrete placing operations. Temporary supports shall not inhibit the functioning of the PTFE spherical bearing after concrete is placed. Temporary supports shall not restrict the movement at bridge joints due to temperature changes and shortening from prestress forces. Materials for temporary supports within the limits for placing concrete shall conform to the requirements for form fasteners.

PTFE spherical bearings shall have a first movement static coefficient of friction not exceeding 0.06.

Prior to proof testing, all bearings shall be permanently die-stamped on 2 of 4 sides with markings consisting of bearing number and contract number. Each bearing shall have a unique bearing number and match marks on plate edges to insure correct assembly at the job site.

Full sized PTFE spherical bearings shall be proof tested and evaluated for compression and coefficient of friction in the presence of the Engineer, unless otherwise directed. The proof tests shall be performed on samples randomly selected by the Engineer from the production bearings to be used in the work. Proof testing shall be performed by the Contractor at the manufacturer's plant or at an approved laboratory. If proof tests are not performed at the specified load, the Contractor shall perform additional physical tests in the presence of the Engineer, unless otherwise directed, to demonstrate that the requirements for proof testing at the specified load are satisfied. The Contractor shall give the Engineer at least 7 days notice before beginning proof testing. Proof testing of PTFE spherical bearings shall conform to the following requirements:

- A. One bearing per lot of production bearings shall be proof tested. A lot is defined as 25 bearings or fraction thereof of the same type, within a load category.
- B. The bearing types and proof tests required for each type shall be as follows:
 1. Expansion type bearings shall be proof tested for compression and coefficient of friction.
- C. A load category shall consist of bearings of differing vertical load capacity within a range defined as follows:
 1. Bearings with less than or equal to 2225 kN maximum vertical load capacity.
 2. Bearings with greater than 2225 kN but less than or equal to 8900 kN maximum vertical load capacity.
 3. Bearings with more than 8900 kN maximum vertical load capacity.
- D. Proof tests for compression: The bearing shall be held at the design rotation or 0.02 radians whichever is greater for one hour at 1.5 times the maximum vertical load shown on the plans for the bearing. The device shall be in a rotated position during the test. The rotation may be imposed on the bearing by inserting a beveled plate between the bearing and the restraining surface prior to loading.
- E. Proof tests for coefficient of friction: The tests shall be performed at the maximum vertical load shown on the plans for the bearing with the test load applied for 12 hours prior to friction measurement and the following:
 1. The tests shall be arranged to allow measurement of the static coefficient of friction on the first movement of the bearing.
 2. The first movement static and dynamic coefficients of friction shall be measured at a sliding speed not exceeding 25 millimeter per minute and shall not exceed the specified coefficient of initial static friction.
 3. The test bearings shall be subjected to a minimum of 100 movements of at least 25 mm of relative movement at a sliding speed not exceeding 300 millimeter per minute. After cycling, the first movement static and dynamic coefficients of friction shall be measured again at a sliding speed not exceeding 25 millimeter per minute and shall not exceed the specified coefficient of initial static friction.
- F. The bearing surfaces shall be cleaned prior to proof testing.
- G. Proof testing of bearings shall be done after conditioning specimens for 12 hours at $21^{\circ}\pm 8^{\circ}\text{C}$.

- H. The proof tested bearings shall show no visible sign of: (1) bond failure of bearing surfaces, (2) separation or lift-off of plates from each other or from PTFE surfaces, or (3) other defects. When a proof tested bearing fails to comply with these specifications, all bearings in that lot shall be individually tested for acceptance.
- I. Proof test results shall be certified correct and signed by the testing laboratory personnel who conducted the test and interpreted the test results. Proof test results shall include the bearing numbers of the bearings tested.

Quantities of PTFE spherical bearings will be determined as units from actual count in the completed work. A PTFE spherical bearing with more than one PTFE surface shall be considered a single PTFE spherical bearing.

The contract unit price paid for PTFE spherical bearing shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the bearing, complete in place, including masonry and sole plates, anchor bolts and sleeves, mortaring of bolts, temporary supports, proof testing, and cleaning and painting of PTFE spherical bearings, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

If a portion or all of PTFE spherical bearings are either fabricated or tested at a site more than 480 air line kilometers from both Sacramento and Los Angeles, additional shop inspection expenses will be sustained by the State. Payment to the Contractor for furnishing PTFE spherical bearings will be reduced \$5,000 for any fabrication and testing site located more than 480 air line kilometers from both Sacramento and Los Angeles, or in the case where a fabrication or testing site is located more than 4800 air line kilometers from both Sacramento and Los Angeles, payment will be reduced \$15,000.

10-1.53 HINGE C AND D BEARINGS

The two types of bearings at Hinges C and D shall be designed by the manufacturer in accordance with the Standard Specifications, these special provisions and as directed by the Engineer. The Hinge C and D bearings shall consist of polytetrafluoro-ethylene (PTFE) and stainless steel bearing surfaces, structural steel plates, and anchors conforming to the details shown on the plans and these special provisions. The Type I bearings shall have built-in electronic load measuring capabilities using load cells.

Attention is directed to "Health Monitoring(Shipping Channel Span)," "Steel Structures," and "Installing Bearings At Hinges C and D" of these special provisions. The bearing manufacturer shall coordinate the design of the Type I bearings with the Health Monitoring (Shipping Channel Span) instrumentation designer and with the structural steel fabricator for both the Type I and the Type II bearings.

The manufacturer of the Hinge C and D bearings shall show evidence that similar bearings (with regard to size, load capacity, configuration and movement capability) furnished by the same manufacturer and used in conditions similar to this application, and shall have had at least 3 years of satisfactory service at each of 2 projects. Such evidence shall be submitted as part of the working drawings and calculations required herein.

Design of the Hinge C and D bearings shall be in accordance with the requirements of Section 14, "Joints and Bearings," of the AASHTO LRFD Bridge Design Specifications, 2nd Edition with 1999 Interims, the Caltrans Bridge Design Specifications and these special provisions.

A qualified representative of the manufacturer shall be present during testing of the bearings and during installation of the first bearing and shall be available for advice during any remaining installations.

The Contractor shall submit to the Resident Engineer's Office for approval in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," working drawings and calculations of the Hinge C and D bearings. Calculations and working drawings shall be stamped and signed by an engineer who is registered as a Civil Engineer in the State of California. For initial review, 4 sets shall be submitted for other structures. After review, between 6 and 12 sets, as requested by the Engineer, shall be submitted to the Resident Engineer's Office for final approval and for use during construction.

The working drawings for Hinge C and D bearings shall include a description of the method of mechanical interlocking of the PTFE fabric to the metallic substrate, details of temporary support for the Hinge C and D bearing plates during jacking and nonshrink grout placement and curing and details of the proposed acceptance proof testing. The working drawing shall also include a "Maintenance and Replacement" manual. The manual shall include complete details and descriptions for: removal and replacement of the bearings, any required servicing of the bearings or stainless steel sliding surface during the design life, including a proposed maintenance schedule, a description and means of determining the amount of wear for the sweeps and the PTFE surfaces, and a procedure for replacing the wearing surfaces of the sweeps. The design calculations shall include a calculation for the amount of wear for all contact surfaces loaded at service load level and traveling over a thermal stroke range of plus or minus 130mm on a daily basis. The design life of the bearings shall be 35 years. For purposes of the wear calculations, the temperature shall be assumed to be constant at 10°C.

Working drawings shall be 279 mm x 432 mm or 559 mm x 864 mm in size and each drawing and calculation sheet shall include the name of the structure as shown on the contract plans, District-County-Route, bridge number, and contract number.

Working drawings shall be submitted sufficiently in advance of the start of the affected work to allow time for review by the Engineer and correction by the Contractor of the drawings without delaying the work. Such time shall be proportional to the complexity of the work but in no case shall such time be less than 6 weeks after complete drawings and all support data are submitted.

At the completion of each structure on the contract, one set of reduced prints on 75-g/m² (minimum) bond paper, 279 mm x 432 mm in size, of the corrected original tracings of all working drawings for each structure shall be furnished to the Engineer. Reduced prints of drawings which are common to more than one structure shall be submitted for each structure. An index prepared specifically for the drawings for each structure containing sheet numbers and titles shall be included on the first reduced print in the set for each structure. Reduced prints for each structure shall be arranged in the order of drawing numbers shown in the index.

The edge of the corrected original tracing image shall be clearly visible and visually parallel with the edges of the page. A clear, legible symbol shall be provided as near to the upper left side of each page as is feasible within the original print to show the amount of reduction and a horizontal and vertical scale shall be provided on each reduced print to facilitate enlargement to original scale.

Hinge C and D bearings shall be installed on surfaces prepared in conformance with the provisions in Section 55-3.19, "Bearings and Anchorages," of the Standard Specifications with the following exceptions:

1. The Type I bearings shall be placed parallel to the top or bottom surface of the box girders.
2. The Type II bearings shall be placed with the sliding surfaces parallel to the plate girder flanges.
3. All references to "mortar" in Section 55-3.19, "Bearings and Anchorages," shall be replaced with "nonshrink grout."
4. All bearing plates to be attached to the concrete portion of the structure shall be grouted into place. Where necessary to properly anchor the masonry plates to the concrete, the Contractor shall construct blockouts into the concrete. Where blockouts are used, blockout pourbacks shall be made at the same time as the nonshrink grout placement using nonshrink grout.

The manufacturer shall furnish certificates of compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for all material used in the Hinge C and D bearings. The certification shall be supported by a copy of the results of all proof tests performed on the bearings.

The Hinge C and D bearings shall be designed to be easily replaceable by the removal of bolts and without requiring the removal of concrete or grouted anchors. Welding of the sole plates to the girder flanges will not be allowed.

PTFE surfaces of Hinge C and D bearings shall be unfilled PTFE fabric made from virgin PTFE oriented multifilament and other fibers. The resin in the filaments shall be virgin PTFE material (not reprocessed) in conformance with the requirements of ASTM Designation: D 1457.

At the highest point of substrate and after compression, the PTFE fabric shall have a minimum thickness of 1.6 mm and a maximum thickness of 3.2 mm, unless wear calculations or backup experimental results show that a different thickness is required.

Flat stainless steel surfaces shall be a weld overlay on structural steel plate, or solid or sheet stainless steel conforming to the requirements of ASTM Designation: A 240, Type 316 with a minimum thickness of 2.2 mm. The bearing manufacturer shall coordinate the flatness of the finished stainless steel surface (and the underlying steel such as sole plate) with the flatness and parallelness of the flanges of box beam such that the friction coefficients and minimum contact pressures required in these special provisions are obtained in the finished bearings.

Curved stainless steel surfaces, if used, shall be solid stainless steel conforming to the requirements of ASTM Designation: A 240, Type 316.

If used, curved stainless steel surfaces exceeding 101.6 mm in thickness shall be either a weld overlay on structural steel plate or solid stainless steel conforming to the requirements of ASTM Designation: A 240, Type 316. Stainless steel sheet will not be allowed.

When a weld overlay is used for stainless steel surfacing, the overlay shall be placed by submerged arc welding using Type 309L electrodes. The finished overlay shall have a 2.38 mm minimum thickness after welding, grinding and polishing. Prior to welding, the manufacturer must submit a complete weld procedure specification (WPS) with the supporting procedure qualification record (PQR) to the Engineer for approval.

When stainless steel sheets are used for stainless steel surfacing, the sheets shall be attached by perimeter arc welding using Type 309L electrodes. After completion of the weld operation, the stainless steel surface shall be smooth and free from waves. Where the size of stainless steel sheet requires that the sheet be spliced, the splice(s) shall be made near the longitudinal ends of the plate to avoid having a splice in the area of daily travel due to temperature and thermal effects.

Structural steel plates, except stainless steel, shall conform to the requirements of ASTM Designation: A 709/A 709, Grade 50 [345], or 50W [345W]. Sole plates shall be machined for flatness and shall be compatible with the steel box girder and plate girder machining tolerances such that the required bearing performance is achieved.

Welding shall conform to the requirements of ANSI/AASHTO/AWS D1.5. Welding of stainless steel shall conform to the requirements of ANSI/AASHTO/AWS D1.6.

The PTFE fabric on sliding bearing surfaces shall be epoxy bonded and mechanically interlocked to the steel substrate. All bonding shall be done under controlled factory conditions. The mechanical interlock on the s surface must be integrally machined into the steel substrate. Welded retention grids will not be allowed. Any edges, other than the selvage shall be oversown or recessed so that no cut fabric edges are exposed.

After completion of the bonding operation the PTFE surface shall be smooth and free from bubbles.

The surface of the bearing elements shall be controlled such that upon completion of the bearing assembly the PTFE to stainless steel interface shall be in full bearing. In addition, the bearings shall be fitted with a device that allows the bearings to be pre-compressed prior to installation such that a minimum contact pressure, as shown on the plans, is achieved at all times. The pre-compression shall be sufficient to accommodate the amount of anticipated support separation between any pair of bearings shown on the plans and to provide the required minimum contact pressure at all times. Pre-compression of the bearings may be obtained by the use of a compressed rubber bearing pad, or other means acceptable to the Engineer, but not through the use of metallic springs or hydraulic devices. The pre-compression device that allows the bearings to be compressed at installation shall also be usable in the future to compress the bearings for removal and repair of replacement.

In addition to the pre-compression devices, the bearings shall be designed to accept temporary connections to the concrete diaphragms while the supporting nonshrink grout is curing, see the requirements in "Installing Hinge C and D Bearings" elsewhere in these special provisions. The temporary connections should not restrain the bearing from rotating, which could occur due to thermal effects, but should hold the bearings such that the sliding of the bearing on the stainless steel (with the bearing in a compressed state and with out any significant load) does not disturb the grout curing.

The mating surface of the stainless steel with the PTFE surfacing shall have a polished surface finish of less than 0.5 μm root-mean-square (rms), determined in conformance with the requirements in ANSI Standard B46.1. The finishing of the stainless steel shall be in the longitudinal direction of the plate.

Metal surfaces of bearings exposed to the atmosphere in the completed work, except stainless steel surfaces shall be cleaned and painted in conformance with the provisions in Sections 59-2, "Painting Structural Steel," and 91, "Paint" of the Standard Specifications, and "Clean and Paint Structural Steel" of these special provisions.

Finish coats will not be required on the bearings.

The Type I bearings shall be fitted with electro-mechanical transducers (load cells) which allow the load on the bearings to be precisely determined. The load cells shall not jeopardize the load carrying capability or performance of the bearings. Hydraulic type load measuring devices will not be allowed. Load cells shall be rugged sealed units that are an integral part of the bearing and shall be designed for outdoor service in hostile environments. Load cells shall include internal temperature compensation and an internal calibration resistor for "push-bottom" calibration reference. Load cells shall use vibrating wire strain gages suitable for sampling at intervals of several seconds. Each load cell shall be individually tested and calibrated and furnished with a calibration certificate. Each load cell shall be fitted with a standard wiring connector compatible with the data collection system specified in "Health Monitoring System(Shipping Channel Span)" elsewhere in these special provisions. The bearing manufacturer shall coordinate the bearing load cell outputs with the shipping channel span instrumentation Contractor. The 8- Type I bearings located at Hinge D shall be furnished with wiring long enough to reach the shipping channel span data collection system. Connections to the ADAS system shall be by the shipping channel span instrumentation contractor. The wiring connector for the 8- Type I bearings located at Hinge C shall be located in such a manner that it is easily accessible for making readings and the connector shall be fitted with an imprinted stainless steel tag with information of the manufacturer of the load cell and enough information to trace the load cell to a calibration certificate. The Contractor shall also provide a handheld measuring instrument that can be individually connected to each of the 8- Type I bearings located at Hinge C to determine the load in the bearings at any time. The bearing manufacturer shall provide State personal and their representatives a 4-hour training class and 10 copies of an "Operation Manual" for the supplied measuring instrument. The load cells shall have the following minimum properties:

Load Ranges: From 0 to -1.5 times the maximum bearing load shown on the plans (compression negative as standard)

Overload: 150% of rated capacity without calibration change

Non-linearity: less than $\pm 1.0\%$ Full Scale Output (FSO) by terminal method

Hysteresis: less than $\pm 0.1\%$ FSO

Repeatability: better than $\pm 0.1\%$ FSO

Initial zero balance :within $\pm 0.5\%$ FSO

Thermal zero shift: less than $\pm 0.2\%$ FSO per 100°F (0.002% FSO °F)

Thermal span shift: less than $\pm 0.2\%$ FSO per 100°F (0.002% FSO °F)

Operating temperature range: from -20°C to +50°C

Hinge C and D bearings which are mounted above their associated stainless steel sliding surface shall be fitted with sweeps on each side of the bearing to clean the stainless steel sliding surface in front and behind the bearings in the event of an earthquake. The sweeps shall consist of neoprene or other suitable materials that will not damage the stainless steel surface but which are capable of removing dust and small particles that may accumulate over time in the unused sliding area of the stainless steel plates. The sweeps shall be fitted to the bearings such that they do not impact the load carrying capacity of the bearings and are easily replaceable. The sweeps shall be designed for 10 years of wear due to normal thermal movements of the bridge. Two sets of spare replacement wearing parts for each sweep shall be provided with each bearing requiring sweeps. The spare wearing parts shall be vacuum sealed and wrapped in heavy duty plastic for long term storage by the State.

On the Type I Hinge C and D bearings, where the bearing is located above the stainless steel sliding surface, the stainless steel not directly under the bearing shall be covered with a retractable neoprene bellows to further protect the stainless steel surface from the accumulation dust and debris. The bellows shall be attached in such a way that it may be easily retracted to allow inspection of the bearing and the stainless steel sliding surface.

Hinge C and D bearing assemblies shall be assembled at the factory. Each assembly shall have a minimum of 4 temporary steel straps which are bolted to threaded holes in the masonry and sole plates so that the entire assembly is shipped as a unit and remains intact when uncrated and installed. Welding of the steel straps will not be allowed. Straps must be adequate for vertical lifting purposes. Bearing dismantling will only be allowed under the direction and in the presence of the Engineer. The bearing may be separated from the sole plate for shipping purposes, as approved by the Engineer, and only if a temporary smaller sole plate with stainless steel surface is provided.

During fabrication, the maximum temperature of bonded PTFE surfaces shall be 150°C.

Damaged bearings and bearings with scratched mating surfaces shall be replaced or resurfaced.

Hinge C and D masonry plates shall be temporarily supported during nonshrink grout placement. Temporary supports shall prevent the rotation or displacement of the bearing during nonshrink grout placing operations. Temporary supports shall not inhibit the functioning of the Hinge C and D bearings after nonshrink grout is placed. Temporary supports shall not restrict the movement at bridge joints immediately due to temperature changes and shortening from prestress forces or in the future from seismic events. Materials for temporary supports within the limits for placing nonshrink grout shall conform to the requirements for form fasteners.

Hinge C and D bearings shall have a first movement static coefficient of friction as specified in AASHTO LRFD Section 14.7.2.5. The coefficient of friction shall comply with values specified in table 14.7.2.5-1 for range of stresses varying from minimum stress provided by pre-compression load to maximum stress at the strength limit design load and for a temperature of 20°C. The bearings, including the anchorages, shall be designed for a lateral load corresponding to three times the maximum first movement static friction coefficient.

Prior to proof testing, all bearings shall be permanently die-stamped on 2 of 4 sides with markings consisting of bearing number and contract number. Each bearing shall have a unique bearing number and match marks on plate edges to insure correct assembly at the job site.

Full sized Hinge C and D bearings shall be proof tested and evaluated for compression and coefficient of friction in the presence of the Engineer, unless otherwise directed. The proof tests shall be performed on samples randomly selected by the Engineer from the production bearings to be used in the work. Proof testing shall be performed by the Contractor at the manufacturer's plant or at an approved laboratory. Proof tests shall be performed at the specified loads. The Contractor shall give the Engineer at least 7 days notice before beginning proof testing. Proof testing of Hinge C and D bearings shall conform to the following requirements:

- A. All Type I bearings shall be tested in compression to confirm the accuracy of the built in load cells. The load applying ram and its associated load cell shall have been calibrated within the prior 3 months.
Compression tests to verify built in load cells in all Type I bearings: Each bearing shall be held at the maximum design rotation for one hour at 1.2 times the maximum vertical strength limit loads shown on the plans for the bearing. The device shall be in a rotated position during the test. The rotation may be imposed on the bearing by inserting a beveled plate between the bearing and the restraining surface prior to loading. A reading of the load cell shall be made every 5 minutes for the full hour. Acceptance: load cell measurements shall not vary by more than 2.0% and shall agree within 2.0% of the calibrated ram's measured load.
- B. Two bearing of each type, randomly selected by the Engineer, shall be proof tested.
The bearing types and proof tests required for each type shall be as follows:
 - 1. The Type I bearings shall be proof tested for maximum and minimum compression and coefficient of friction in a horizontal position.
 - 2. The Type II bearings shall be proof tested for maximum and minimum compression and coefficient of friction with the sliding surface in the vertical plane.

Proof tests for maximum compression: The bearings to be proofed shall be held at the maximum design rotation for one hour at 1.2 times the maximum strength limit load shown on the plans for the bearing. The device shall be in a rotated position during the test. The rotation may be imposed on the bearing by inserting a beveled plate between the bearing and the restraining surface prior to loading. Acceptance: during and after the test, the bearing shall be visually inspected and shall show no visible sign of: (1) bond failure of bearing surfaces, (2) separation or lift-off of plates from each other or from PTFE surfaces, or (3) other defects.

Proof tests for minimum compression: The bearings to be proofed shall be inserted into the test setup in the same fashion the bearings will be inserted into the hinges using the maximum dimensions for clearances between the box beams or plate girders and the concrete as shown on the plans. The bearings need not be grouted into position for the test but shall be firmly held in position by mechanical means. Once in position, the preload device shall be activated and the resulting force in the bearing shall be measured. After one hour, the bearing shall be moved 10mm in a direction perpendicular to the sole plate (to simulate an opening situation) whereupon the resulting load on the bearing shall again be measured. After one additional hour, a compressive load will be applied to the bearing equal to 1.2 times the maximum strength limit load shown on the plans for the bearing. The resulting displacement shall be measured and reported. Acceptance: (1) the average compressive stress on the contact area between the PTFE and the stainless steel shall not be less than 2.5 MPa both after activating the preload device and after the 10mm opening movement, (2) the device shall not bottom out when 1.2 times the maximum strength limit load is applied.

Proof tests for range of motion: The bearings to be proofed shall be moved the full length of available travel (one complete cycle starting with the bearing at the mid length of the stainless steel plate) on the sole plates with a load of 1.2 times the maximum strength limit load shown on the plans for the bearing. The stainless steel sliding surface shall be cleaned with a degreasing solvent prior to performing the range of motion test. No lubricants shall be applied. The manufacturer shall determine the sliding speed. The sole plates shall be mounted to a support surface with a flatness that is equivalent to that which will be provided on the flanges of the steel box girders. The device shall be in a rotated position during the test. The rotation may be imposed on the bearing by inserting a beveled plate between the bearing and the restraining surface prior to loading. Acceptance: No signs of binding during travel, no galling of the stainless steel surface.

Proof tests for coefficient of friction and wear of PTFE: Prior to testing the stainless steel surfaces shall be thoroughly cleaned with a degreasing solvent. These tests shall be performed at both the service and strength limit loads shown on the plans for the bearing, with the test load applied for 12 hours prior to and held constant during determination of the friction coefficients, and the following:

1. The tests shall be arranged to allow measurement of the static coefficient of friction on the first movement of the bearing. Acceptance: static coefficient of friction less than or equal to that required herein for both the service and strength limit states.
 2. The dynamic coefficient of friction shall be measured at a sliding speed not exceeding 2000 millimeters per second but greater than 1000 millimeters per second with a sliding length of plus or minus 1 meter. Acceptance: the dynamic coefficient of friction shall not exceed the specified static friction coefficient of initial movement for both the service and strength limit states.
 3. The test bearings shall be subjected to a minimum of 100 movements of at least 1000 mm of relative movement at a sliding speed between 1000 millimeter per second and 2000 millimeters per second. After cycling, and with the bearing within the 1000mm sliding zone, the first movement static and dynamic coefficients of friction shall be determined again at a sliding speed not exceeding of 2000 millimeters per second. The wear of the PTFE shall be determined. Acceptance: the first movement static and dynamic coefficients shall not exceed the specified coefficient of initial static friction. The wear of the PTFE shall be negligible.
- C. The bearing surfaces shall be cleaned with a degreasing solvent prior to proof testing and no grease will be allowed.
- D. Proof testing of bearings shall be done after conditioning specimens for 12 hours at $21^{\circ}\pm 8^{\circ}\text{C}$.
- E. If any proof tested bearing fails to comply with these specifications, all bearings of that type shall be individually tested for acceptance.
- F. Proof test results shall be certified correct and signed by the testing laboratory personnel who conducted the test and interpreted the test results. Proof test results shall include the bearing numbers of the bearings tested.

Payment

Quantities of Hinge C and D bearings will be determined as units from actual count in the completed work. Rejected bearings will not be paid for.

The contract unit price paid for Hinge C and D bearings shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in designing and constructing the bearing, complete in place, including masonry and sole plates, anchor bolts and sleeves, sweeps, bellows, replacement sweep wearing parts, built-in loads cells and cabling, pre-compression devices, grouting of bolts, temporary supports, proof testing, and cleaning and painting of Hinge C and D bearings, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

If a portion or all of Hinge C and D bearings are either fabricated or tested at a site more than 480 air line kilometers from both Sacramento and Los Angeles, additional shop inspection expenses will be sustained by the State. Payment to the Contractor for furnishing Hinge C and D bearings will be reduced \$10,000 for any fabrication and testing site located more than 480 air line kilometers from both Sacramento and Los Angeles, or in the case where a fabrication or testing site is located more than 4800 air line kilometers from both Sacramento and Los Angeles, payment will be reduced \$20,000.

10-1.54 INSTALLING BEARINGS AT HINGES C AND D

The bearings at Hinges C and D shall be installed in accordance with the construction sequence shown on the plans and these special provisions.

JACKING PROCEDURE AND DETAILS.—

The Contractor shall submit to the Engineer working drawings and design calculations for the jacking procedure necessary to install the Hinges C and D bearings. Such drawings and design calculations shall be signed by an engineer who is registered as a Civil Engineer in the State of California. The jacking procedure working drawings and design calculations shall conform to the requirements in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. The number of sets of drawings and design calculations and times for review for the jacking procedure shall be the same as specified for falsework working drawings in Section 51-1.06A, "Falsework Design and Drawings," of the Standard Specifications.

Working drawings for the jacking procedure shall include details of a rolling support that will allow the jacking load to be maintained while allowing the steel box girders to move longitudinally due to temperature changes. Maximum movement of the box girders over an 8 hour cure time for the grout is anticipated to be no more than 130 mm.

The jacking procedure working drawings shall include descriptions and values of all loads, descriptions of equipment to be used, complete details and calculations for jacking the steel box girder beams. The location of any of the Contractor's equipment on the bridge in the hinge span and the adjacent two spans on either side of the hinge, as well as any proposed Contractor operations in these areas, shall be included in the submittal. Live loading on the structure may be limited during the time of the jacking procedure and installation of the bears, as directed by the Engineer, to limit load fluctuations during jacking.

A redundant system of supports shall be provided during the entire jacking operation for backup should any of the jacks fail. The redundant system shall include stacks of steel plates added as necessary to maintain the redundant supports at each jack location within 6 mm of the jacking sill or corbels.

Jacks shall be positioned to bear on the box girder flanges directly below the box webs and on the concrete jacking seats provided. Jacks shall be loaded simultaneously with identical loading being applied at each steel box girder.

The jacking procedure calculations shall show a summary of computed stresses in the jacks and in the connections between jacks and the concrete bearing seats. The computed stresses shall include the effect of the jacking sequence.

The design of jacking procedure will not be approved unless it is based on the use of allowable stresses which are no greater than those described in Section 51-1.06A(2), "Design Stresses, Loadings, and Deflections," of the Standard Specifications.

The jacks shall support the jacking loads shown on the plans. The jacks shall be mechanically connected to the jacking seats. The mechanical connections shall be capable of resisting the friction forces resulting from longitudinal movement of the steel box girder on the roller support during the time the grout is curing. Details of the temporary connections and supports for the bearings shall be provided.

JACKING PROCEDURE.—

Attention is directed to Paragraphs 1 through 7 of Section 51-1.06B, "Falsework Construction," of the Standard Specifications. All reference to falsework in these paragraphs shall also apply to the jacking procedure.

Each jack shall be equipped with either a pressure gage or a load cell for determining the jacking force. Pressure gages shall have an accurately reading dial at least 150 mm in diameter. Each jack shall be calibrated by a private laboratory approved by the Transportation Laboratory within 6 months prior to use and after each repair, unless otherwise directed. Each jack and its gage shall be calibrated as a unit with the cylinder extension in the approximate position that it will be at final jacking force and shall be accompanied by a certified calibration chart. Load cells shall be calibrated and provided with an indicator by which the jacking force is determined. Jacking loads shall be automatically controlled such that equal loading is applied simultaneously to each steel box girder.

Welding, welder qualification, and inspection of welding for all steel members shall conform to the requirements of ANSI/AASHTO/AWS D1.5.

Prior to activating the jacks, an engineer for the Contractor who is registered as a Civil Engineer in the State of California shall inspect the jacks, for conformity with the working drawings. The Contractor's registered engineer shall certify in writing that the jacks, including connections and roller supports substantially conform to the working drawings, and that the material and workmanship are satisfactory for the purpose intended. A copy of this certification shall be available at the site of the work at all times while the jacks are pressurized.

The Contractor's registered engineer shall be present at the bridge site at all times when jacking operations or adjustments are in progress. Should an unplanned event occur, the Contractor's registered engineer shall submit immediately to the Engineer for approval, the procedure or proposed operation to correct or remedy the occurrence.

After installing the upper bearings at Diaphragm B, with the bearings in the fully compressed position (the bearing gap mechanically closed via the bearing pre-compression device), a force equal to the load shown on the plans shall be applied to the structure near Diaphragm C by the jacking system. The jacking force shall be maintained until the nonshrink grout anchoring the bottom bearing at Diaphragm C, again with the bearing in the full compressed position, has achieved the required compressive strength specified or shown on the plans. After removal of the jacking load, the pre-compression devices at the installed bearings shall be released. Next, the remaining lower bearings at Diaphragm B and the remaining upper bearings at Diaphragm C shall be grouted into position with the pre-compression device closing the bearings to _ their closing capacity and the PTFE just touching the stainless steel. During the curing time for the nonshrink grout, these bearings shall be temporarily connected to the diaphragm to prevent disturbing the nonshrink grout. After curing of the nonshrink grout, the temporary connections to the diaphragms will be released followed by the release of the bearing pre-compression devices.

Jacking operations shall be carefully controlled and monitored to ensure that the jacking loads are applied simultaneously to each box girder at the hinge to prevent distortion and excessive stresses that would damage the structure.

Should unanticipated displacements, cracking or other damage occur, the jacking shall be discontinued until corrective measures satisfactory to the Engineer are performed. Damage to the structure as a result of the Contractor's operations shall be repaired by the Contractor according to the requirements in Section 7-1.11, "Preservation of Property," of the Standard Specifications.

REMOVING JACKS—

Jacks shall not be released until the grout below the bearings has attained 100 percent of the specified strength. Pressure on the jacks shall be slowly released from all jacks simultaneously at the same decent rate.

Full compensation for jacking to install the Hinge C and D bearings, including all the work involved in designing, constructing, and jacking the steel box girders, and temporarily supporting the bearings, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer shall be considered as included in the unit price paid per bearing for Hinge C and D bearings of the various types shown on the plans, and no additional compensation will be allowed therefor.

10-1.55 ELASTOMERIC BUMPERS

Elastomeric bumpers at hinges shall conform to the requirements of these special provisions.

Energy absorbing elastomeric bumpers shall consist of:

- A. One or more molded rubber elements, of the maximum sizes shown on the drawings, exhibiting the following performance for loading normal to the elements:

At Hinges C and D:

Minimum energy absorbed(per web)	200 kJ
Maximum reaction @ above energy	1000 kN

At Hinges E:

Minimum energy absorbed(per web)	110 kJ
Maximum reaction @ above energy	850 kN

Rubber elements, of the sizes shown on the drawings, or one or more molded rubber elements exhibiting the following performance for loading normal to the elements:

At Hinges A:

Minimum energy absorbed	6600 kN-m
Maximum compressive stress on mounting area @ above energy	45 MPa
Maximum compressive strain @ above energy	50%

At Hinges B:

Minimum energy absorbed	5140 kN-m
Maximum compressive stress on mounting area @ above energy	45 MPa
Maximum compressive strain @ above energy	50%

Each bumper shall be capable of absorbing a horizontal shearing force equal to 30% of its rated reaction while simultaneously absorbing the above-defined minimum energy without exceeding the above-defined maximum reaction or compressive stress on the bearing mounting area. Each bumper shall be identical and interchangeable at any hinge or abutment installation.

The maximum allowable standoff, undeflected, is 500 mm except at hinges A and B where the maximum standoff is 250mm. Where possible, the bumpers shall be a commercially available "off-the-shelf" bumpers from a manufacturer who specializes in marine fender bumpers.

Rubber Elements: Elements shall be molded of rubber, homogeneous and free from any defects, impurities, pores or cracks, bonded to integral, steel mounting plates. The steel shall be fully encased in rubber with a minimum thickness of 1.6 mm.

The rubber from which the elements are molded shall be natural or synthetic conforming to one of the following ASTM D2000 line callouts:

3BA 720 A14, B13, C12, EA14, F17
3BA 620 A14, B13, C12, EA14, F17

Steel: The integral steel mounting flanges shall be of ASTM A36, or stronger, steel. External mounting plates, if used shall be galvanized in conformance with the requirements in Section 75, "Miscellaneous Metal," of the Standard Specifications.

Anchors/Concrete Embedments: Concrete embedments (anchor bolts and anchor bolt inserts) shall be no closer than 150mm to an edge, and shall be designed to resist a pullout, assuming 45 MPa concrete and 1.25 times greater than the breaking strength of the male threads. Threaded embeds for attaching rubber elements to concrete must have 316 stainless steel, female threads.

Attaching Bolts: Bolts, nuts and washers for attaching elements to embedded anchor sleeves shall be of size and quantity recommended by elastomeric bumper manufacturer. Bolts shall be 316 stainless steel per ASTM A193, class 2, grade B8M2. Nuts shall be 316 stainless steel per ASTM A194, grade 8M heavy hex. Washers shall be 316 stainless steel.

Quality Control

Performance Curves: The Contractor shall submit certified performance curves for each elastomeric element supplied.

Certifications: The Contractor shall submit certified test report or certificate of conformance or compliance, furnished by an independent testing agency, attesting that each product or material furnished under this specification meets the requirements herein.

Certified test report or certificate shall also be furnished for:

- Rubber compound
- Bolts and embedments

Working Drawings: the Contractor shall submit working drawings to the Engineer for approval, in accordance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. The working drawings shall be signed by an engineer who is registered as a Civil Engineer in the State of California and shall include:

- A. Elastomeric bumper assembly and layout at each hinge or abutment
- B. Anchor embedments and setting plan

Working drawings shall indicate materials, thicknesses and dimensions.

Manufacturer Qualifications

Manufacturer of the elastomeric bumpers shall have been in the business of manufacturing molded/bonded, buckling-type, rubber marine fenders for at least 10 years and show proof of 3 installations, each having been in service at least 3 years. Evidence supporting the manufacturer's qualification's shall be submitted with the working drawings.

Payment

The contract lump sum price paid for elastomeric bumpers shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing the elastomeric bumpers, complete in place, including anchor bolts and sleeves, and preparing and submitting working drawings and certifications, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.56 REINFORCEMENT

Reinforcement shall conform to the provisions in Section 52, "Reinforcement," of the Standard Specifications and these special provisions.

Attention is directed to "Substitution of Non-Metric Materials and Products", "Integrated Drawings" and "Welding Quality Control" elsewhere in these special provisions.

The third paragraph of Section 52-1.04, "Inspection," of the Standard Specifications is amended to read:

- A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications shall also be furnished for each shipment of epoxy-coated bar reinforcement or wire reinforcement certifying that the coated reinforcement conforms to the requirements in ASTM Designation: A 775/A 775M or A 884/A 884M, respectively, and the provisions in Section 52-1.02B, "Epoxy-coated Bar Reinforcement," of the Standard Specifications. The Certificate of Compliance shall include all of the certifications specified in ASTM Designation: A 775/A 775M or A 884/A 884M respectively, and a statement that the coating material has been prequalified by acceptance testing performed by the Valley Forge Laboratories, Inc., Devon, Pennsylvania.

The third paragraph of Section 52-1.08C, "Mechanical Butt Splices," of the Standard Specifications is amended to read:

- The total slip of the reinforcing bars within the splice sleeve after loading in tension to 200 MPa and relaxing to 20 MPa shall not exceed the values listed in the following table. The slip shall be measured between gage points that are clear of the splice sleeve.

Reinforcing Bar Number	Total Slip (µm)
13	250
16	250
19	250
22	350
25	350
29	350
32	450
36	450
43	600
57	750

The first paragraph of Section 52-1.08C(5), "Sleeve-Lockshear Bolt Mechanical Butt Splices," of the Standard Specifications is amended to read:

- The sleeve-lockshear bolt type of mechanical butt splices shall consist of a seamless steel sleeve, center hole with centering pin, and bolts that are tightened until the bolt heads shear off with the bolt ends left embedded in the reinforcing bars. The seamless steel sleeve shall be either formed into a V configuration or shall have 2 serrated steel strips welded to the inside of the sleeve.

Section 52-1.08F, "Nondestructive Splice Tests," of the Standard Specifications is amended by deleting the seventh paragraph.

Individual hoops, made continuous with butt welded splices, which are substituted for spiral reinforcement, shall conform to the requirements for "Ultimate Butt Splices" of these special provisions.

The following paragraphs are added after the third paragraph of Section 52-1.08A, "Lapped Splices," of the Standard Specifications:

- Where 300mm or more of concrete is placed below the bar: Reinforcing bars No. 25, or smaller, shall be lapped at least 59 diameters of the smaller bar joined, and reinforcing bars Nos. 29, 32 and 36 shall be lapped at least 78 diameters of the smaller bar joined, except when otherwise shown on the plans.
- Epoxy coated reinforcing bars No. 25, or smaller, shall be lapped at least 54 diameters of the smaller bar joined, and epoxy coated reinforcing bars Nos. 29, 32 and 36 shall be lapped at least 72 diameters of the smaller bar joined, except when otherwise shown on the plans.
- Where 300mm or more of concrete is placed below the bar: Epoxy coated reinforcing bars No. 25, or smaller, shall be lapped at least 70 diameters of the smaller bar joined, and epoxy coated reinforcing bars Nos. 29, 32 and 36 shall be lapped at least 94 diameters of the smaller bar joined, except when otherwise shown on the plans.

The fifth paragraph of Section 52-1.08B, "Butt Welded Splices," of the Standard Specifications is amended to read:

- A. Butt welds shall be made with multiple weld passes using a stringer bead without an appreciable weaving motion. The maximum stringer bead width shall be 2.5 times the diameter of the electrode and complete slag removal shall be performed between each weld pass. Weld reinforcement shall not exceed 4mm in convexity.
- B.

The tenth paragraph of Section 52-1.08F, "Nondestructive Splice Tests," of the Standard Specifications is amended to read:

- The radiographic procedure used shall conform to the requirements in AWS D1.1-96, Section 6, Part E, Radiographic Testing and the following:

Two exposures shall be made for each complete joint penetration butt welded splice. For each of the 2 exposures, the radiation source shall be centered on each bar to be radiographed. The first exposure shall be made with the radiation source placed at zero degrees and perpendicular to the weld root and identified with a station mark of "0." The second exposure shall be at 90 degrees to the "0" station mark and shall be identified with a station mark of "90." When obstructions prevent a zero or 90 degree placement of the radiation source, the source may be rotated around the centerline of the reinforcing bar a maximum of 25 degrees. The position of the location station mark shall be clearly identified on the bar to facilitate the removal of discontinuities if repairs are required.

Radiographs shall be made by either X-ray or gamma ray. Radiographs made by X-ray or gamma rays shall have densities of not less than 2.3 nor more than 3.5 from the center of the bar to the outside radius of the weld. A tolerance of 0.05 in density is allowed for densitometer variations. Gamma rays shall be from the iridium 192 isotope and the emitting specimen shall not exceed 4.45 mm in the greatest diagonal dimension.

The radiographic film shall be placed perpendicular to the radiation source at all times; parallel to the root line of the weld unless source placement determines that the film must be turned; and as close to the root of the weld as possible. The radiographic film shall also be placed flat against the backing bar in the zero degree view.

The minimum source to film distance shall be maintained so as to ensure that all radiographs maintain a maximum geometric unsharpness of 0.020 at all times, regardless of the size of the reinforcing bars. The minimum source to subject distance shall not be less than eight times the thickness of the diameter of the bar plus the backing and weld reinforcement.

Penetrameters shall be placed on the source side of the bar and perpendicular to the radiation source at all times. One penetrometer shall be placed in the center of each bar to be radiographed, perpendicular to the weld root, and adjacent to the weld. Penetrometer images shall not appear in the weld area.

When radiography of more than one weld is being performed per exposure, each exposure shall have a minimum of one penetrometer per bar, or 3 penetrameters per exposure. When 3 penetrameters per exposure are used, one penetrometer shall be placed on each of the 2 outermost bars of the exposure, and the remaining penetrometer shall be placed on a centrally located bar.

An allowable weld buildup of 4 mm may be added to the total material thickness when determining the proper penetrometer selection. No image quality indicator equivalency will be accepted.

Penetrameters shall be sufficiently shimmed using a radiographically identical material. Penetrometer image densities shall be a minimum of 2.0 and a maximum of 3.6.

Radiographic film shall be Class 1, regardless of the size of reinforcing bars.

Radiographs shall be free of film artifacts and processing defects, including, but not limited to, streaks, scratches, pressure marks or marks made for the purpose of identifying film discontinuities in the area of interest. The area of interest shall be defined as the full cross section of the weld and the heat affected zone in each radiographic view. Outside the area of

interest, markings will be permitted on film that depicts otherwise acceptable film and weld quality. Marking in the area of interest, for the purpose of identifying weld discontinuities, will be permitted on film for welds that will be subsequently retested due to repairs.

Each splice shall be clearly identified on each radiograph and the radiograph identification and marking system shall be established between the Contractor and the Engineer before radiographic inspection begins. Film shall be identified by lead numbers only; etching, flashing or writing in identifications of any type will not be permitted. Each piece of film identification information shall be legible and shall include, as a minimum, the following information: Contractor's name, date, name of nondestructive testing firm, initials of radiographer, contract number, part number and weld number. The letter "R" and repair number shall be placed directly after the weld number to designate a radiograph of a repaired weld. The Engineer must approve all repairs after R-2, as specified in these special provisions.

Radiographic film shall be developed within a time range of one minute less to one minute more than the film manufacturer's recommended maximum development time. Sight development will not be allowed.

Processing chemistry shall be done with a consistent mixture and quality, and processing rinses and tanks shall be clean to ensure proper results. Records of all developing processes and any chemical changes to the developing processes shall be kept and furnished to the Engineer upon request. The Engineer may request, at any time, that a sheet of unexposed film be processed in the presence of the Engineer to verify processing chemical and rinse quality.

The results of all radiographic interpretations shall be recorded on a signed certification and a copy kept with the film packet. The exact measured dimension of the rejected discontinuity must be documented in the test report.

The radiographic procedure used shall conform to the requirements of AWS D1.1-96, Section 6, Part E, Radiographic Testing, and shall also contain the developer temperature, developing time, fixing duration and all rinse times.

Mechanical butt splices for extending existing reinforcing in the future shall be sleeve-threaded mechanical butt splices conforming to Section 52-1.08C(2), "Sleeve-Threaded Mechanical Butt Splices," of the Standard Specifications. The splice shall be fitted with a removable plastic plug at the unused end.

ULTIMATE BUTT SPLICES

Ultimate butt splices shall be either welded or mechanical splices, shall be used at the following locations, and shall conform to the provisions in Section 52, "Reinforcement," of the Standard Specifications and these special provisions:

1. At all permissible splice regions of main pier and column bar reinforcement
2. At bars designated as "L" and "T" bars in piers and columns
3. At all hoops in piers and columns
4. At all permissible splice regions of pile bar reinforcement at Piers 6 through 17
5. At all hoops in piles

GENERAL REQUIREMENTS

The Contractor shall designate in writing an ultimate butt splicing Quality Control Manager (QCM). The QCM shall be responsible directly to the Contractor for 1) the quality of all ultimate butt splicing including the inspection of materials and workmanship performed by the Contractor and all subcontractors; and 2) submitting, receiving, and approving all correspondence, required submittals, and reports regarding ultimate butt splicing to and from the Engineer.

The QCM shall not be employed or compensated by any subcontractor, or by other persons or entities hired by subcontractors, who will provide other services or materials for the project. The QCM may be an employee of the Contractor.

The length of any type of ultimate mechanical butt splice shall not exceed 10 times the bar diameter of the larger bar to be spliced.

All ultimate prejob, production, and job control sample splices shall be 1) a minimum length of 1.5 meters for reinforcing bars No. 25 or smaller and 2 meters for reinforcing bars No. 29 or larger, with the splice located at mid-point, and 2) suitably identified prior to shipment with weatherproof markings that do not interfere with the Engineer's tamper-proof markings or seals. Any splice that shows signs of tampering will be rejected.

A minimum of one control bar shall be removed from the same bar as, and adjacent to, all ultimate prejob, production, and job control sample splices. Control bars shall be 1) a minimum length of one meter for reinforcing bars No. 25 or smaller and 1.5 meters for reinforcing bars No. 29 or larger, and 2) suitably identified prior to shipment with weatherproof markings that do not interfere with the Engineer's tamper-proof markings or seals. The portion of adjacent bar remaining in the work shall also be identified with weatherproof markings that correspond to its adjacent control bar.

Shorter length sample splice and control bars may be furnished if approved in writing by the Engineer.

Each sample splice and its associated control bar shall be identified and marked as a set. Each set shall be identified as representing a prejob, production, or job control sample splice.

The portion of hoop reinforcing bar, removed to obtain a sample splice and control bar, shall be replaced using a prequalified ultimate mechanical butt splice, or the hoop shall be replaced in kind.

Reinforcing bars, other than hoops, from which sample splices are removed, shall be repaired using ultimate mechanical butt splices conforming to the provisions in "Prejob Test Requirements for Ultimate Butt Splices" specified herein, or the bars shall be replaced in kind. These bars shall be repaired or replaced such that no splices are located in the "No Splice Zone" shown on the plans.

Section 52-1.08E, "Job Control Tests," of the Standard Specifications shall not apply.

The provisions for total slip shall not apply to any ultimate splices that are welded or that are used on hoops.

The independent qualified testing laboratory used to perform the testing of all ultimate butt sample splices and control bars shall not be employed or compensated by any subcontractor, or by other persons or entities hired by subcontractors who will provide other services or materials for the project, and shall have the following:

- A. Proper facilities, including a tensile testing machine capable of breaking the largest size of reinforcing bar to be tested.
- B. A device for measuring the total slip of the reinforcing bars across the splice to the nearest 25 μ m, that, when placed parallel to the longitudinal axis of the bar is able to simultaneously measure movement across the splice, at 2 locations, 180 degrees apart.
- C. Operators who have received formal training for performing the testing requirements of ASTM Designation: A 370/A 370M and California Test 670.
- D. A record of annual calibration of testing equipment performed by an independent third party that has 1) standards that are traceable to the National Institute of Standards and Technology, and 2) a formal reporting procedure, including published test forms.

ULTIMATE BUTT SPLICE TEST CRITERIA

Ultimate prejob, production, and job control sample splices shall be tensile tested in conformance with the requirements described in ASTM Designation: A 370/A 370M and California Test 670.

Ultimate prejob and production sample splices shall rupture in the reinforcing bar either: 1) outside of the affected zone or 2) within the affected zone, provided that the sample has achieved at least 95 percent of the ultimate tensile strength of the control bar associated with the sample. In addition, necking of the bar shall be visibly evident at rupture regardless of whether the bar breaks inside or outside the affected zone.

The affected zone is the portion of the reinforcing bar where any properties of the bar, including the physical, metallurgical, or material characteristics, have been altered by fabrication or installation of the splice.

The ultimate tensile strength of each control bar shall be determined by tensile testing the bar to rupture and shall be determined for all control bars, regardless of where each sample splice ruptures. If 2 control bars are tested for one sample splice, the bar with the lower ultimate tensile strength shall be considered the control bar.

Testing to determine the minimum tensile strength, in conformance with the provisions in the ninth paragraph of Section 52-1.08, "Splicing," of the Standard Specifications, will not be required.

PREJOB TEST REQUIREMENTS FOR ULTIMATE BUTT SPLICES

Prior to use in the work, all ultimate butt splices shall conform to the following prejob test requirements:

- A. Eight prejob sample splices for each bar size of each splice type including ultimate mechanical butt splices, ultimate complete joint penetration butt welded splices, and ultimate resistance butt welded splices, that will be used in the work, shall be fabricated by the Contractor. For deformation-dependent types of couplers, 8 sample prejob splices shall also be fabricated for each reinforcing bar size and deformation pattern that will be used in the work.
- B. The sample splices shall be fabricated using the same splice materials, position, operators, location, and equipment, and following the same procedures as will be used to make the splices in the work. In addition, for resistance butt welded splices, the sample splices shall have the weld flash removed and be epoxy-coated as specified elsewhere in these special provisions.
- C. At the option of the Contractor, operator qualification tests may be performed simultaneously with the preparation of prejob sample splices.
- D. If different diameters of hoops are shown on the plans, prejob sample splices, as described above, will only be required for the smallest hoop diameter. In addition, these splices shall be fabricated using the same radius as shown on the plans for these hoops.
- E. Unless otherwise directed in writing by the Engineer, 4 prejob sample splices and control bar sets shall be shipped to the Transportation Laboratory and the remaining 4 sets shall be tested by the Contractor's independent qualified testing laboratory.
- F. Each group of 4 sets from a prejob test shall be securely bundled together and identified by location and contract number with weatherproof markings prior to shipment. Bundles containing fewer than 4 sets will not be tested by the Transportation Laboratory, nor shall they be tested by the independent laboratory.

- G. All 8 sample splices from each prejob test shall conform to the provisions in "Ultimate Butt Splice Test Criteria" specified herein.
- H. Prior to performing any tensile tests on prejob test sample splices, one of the 4 samples shall be tested for, and shall conform to, the provisions for total slip. Should this sample not meet these requirements, one retest, in which the 3 remaining samples are tested for total slip, will be allowed. All 3 of these remaining samples tested shall conform to the aforementioned slip requirements.
- I. For each bundle of 4 sets, a Prejob Test Report shall be prepared by the independent testing laboratory performing the testing. The report shall 1) be signed by an engineer who represents the laboratory and is registered as a Civil Engineer in the State of California; 2) include, as a minimum, the following information for each set: contract number, bridge number, bar size, type of splice, length of mechanical splice, physical condition of test sample splice and control bar, any notable defects, limits of affected zone, total measured slip, location of visible necking area, ultimate strength of each splice, ultimate strength and 95 percent of this ultimate strength for each control bar, and a comparison between 95 percent of the ultimate strength of each control bar and the ultimate strength of its associated splice; and 3) be submitted to the QCM for review and approval, and then to the Engineer.
- J. Test results for each bundle of 4 sets will be reported in writing to the Contractor within 10 working days after receipt of the bundle by the Transportation Laboratory. In the event that more than one bundle is received on the same day, 2 additional working days shall be allowed for providing test results for each additional bundle received. A test report will be made for each bundle received.
- K. Should the Engineer fail to provide the test results within this time allowance and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in providing the test results, the delay will be considered a right of way delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

PRODUCTION TEST REQUIREMENTS FOR ULTIMATE BUTT SPLICES

Production tests shall be performed for all ultimate butt splices used in the work. A production test shall consist of 4 sets of sample splices and control bars removed from each lot of completed splices, except when quality assurance tests are performed.

A lot of ultimate butt splices is defined as 1) 150, or fraction thereof, of the same type of ultimate mechanical butt splices used for each bar size and each bar deformation pattern that is used in the work or 2) 150, or fraction thereof, of ultimate complete joint penetration butt welded splices, or ultimate resistance butt welded splices for each bar size used in the work. If different diameters of hoop reinforcement are shown on the plans, separate lots shall be used for each different hoop diameter.

After all splices in a lot have been completed and the bars have been epoxy-coated, the QCM shall notify the Engineer in writing that all couplers in this lot conform to the specifications and are ready for testing. The sample splices will either be selected by the Engineer at the job site or a fabrication facility, provided the facility is located within an 80-km radius of the jobsite.

At the option of the Contractor, sample splices for spiral reinforcement may be either 1) removed from the completed lot, or 2) prepared in the same manner as specified herein for ultimate prejob sample splices and control bars.

After notification has been received, the Engineer will randomly select the 4 sample splices to be removed from the lot and place tamper-proof markings or seals on them. The Contractor or QCM shall select the adjacent control bar for each sample splice bar, and the Engineer will place tamper-proof markings or seals on them. These ultimate production sample splices and control bars shall be removed by the Contractor, and tested by an independent qualified testing laboratory, in the presence of either the Engineer or the Engineer's authorized representative.

The Engineer or the Engineer's authorized representative will be at the independent qualified testing laboratory within a maximum of 5 working days after receiving written notification that the samples are at the laboratory and ready for testing. Should the Engineer or the Engineer's authorized representative fail to be at the laboratory within this time allowance, and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of this action, the delay will be considered a right of way delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

A sample splice or control bar from any set will be rejected if any tamper-proof marking or seal is disturbed prior to testing.

The 4 sets from each production test shall be securely bundled together and identified with a completed sample identification card prior to shipment to the independent laboratory. The card will be furnished by the Engineer. Bundles of samples containing fewer than 4 sets of splices shall not be tested.

A Production Test Report for all testing performed on each lot shall be prepared by the independent testing laboratory performing the testing and submitted to the QCM for review and approval. The report shall be signed by an engineer who represents the laboratory and is registered as a Civil Engineer in the State of California. The report shall include, as a minimum, the following information for each set: contract number, bridge number, lot number and location, bar size, type of

splice, length of mechanical splice, physical condition of test sample splice and control bar, any notable defects, limits of affected zone, total measured slip, location of visible necking area, ultimate strength of each splice, ultimate strength and 95 percent of this ultimate strength for each control bar, and a comparison between 95 percent of the ultimate strength of each control bar and the ultimate strength of its associated splice.

The QCM must review, approve, and forward each Production Test Report to the Engineer for review before any splices represented by the report are encased in concrete. The Engineer shall have 3 working days to review each Production Test Report and respond in writing after a complete report has been received. Should the Contractor elect to encase any splices prior to receiving notification from the Engineer, it is expressly understood that the Contractor will not be relieved of the Contractor's responsibility for incorporating material in the work that conforms to the requirements of the plans and specifications. Any material not conforming to these requirements will be subject to rejection. Should the Contractor elect to wait to encase any splices pending notification by the Engineer, and should the Engineer fail to complete the review and provide notification within this time allowance, and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in notification, the delay will be considered a right of way delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

At the option of the Contractor, any splices at the locations listed below may be encased in concrete prior to having the QCM review, approve, and forward each Production Test Report to the Engineer. Should the Contractor exercise this option, it is expressly understood that the Contractor will not be relieved of the Contractor's responsibility for incorporating material in the work that conforms to the requirements of the plans and specifications. Any material not conforming to these requirements will be subject to rejection.

- A. 2.5 m CIDH piling
- B. 2.2 m CIDH piling

Prior to performing any tensile tests on production test sample splices, one of the 4 samples shall be tested for, and shall conform to, the provisions for total slip. Should this sample not meet these requirements, one retest, in which the 3 remaining samples are tested for total slip, will be allowed. Should any of the 3 remaining samples not conform to these requirements, all splices in the lot represented by this production test will be rejected.

If 3 or more sample splices from any production test conform to the provisions in "Ultimate Butt Splice Test Criteria" specified herein, all splices in the lot represented by this production test will be considered acceptable.

Should only 2 sample splices from any production test conform to the provisions in "Ultimate Butt Splice Test Criteria" specified herein, one additional production test shall be performed on the same lot of splices. Should any of the 4 sample splices from this additional test fail to conform to these provisions, all splices in the lot represented by these production tests will be rejected.

If only one sample splice from any production test conforms to the provisions in "Ultimate Butt Splice Test Criteria" specified herein, all splices in the lot represented by this production test will be rejected.

If a production test for any lot fails, the Contractor will be required to repair or replace all reinforcing bars from which sample splices were removed, complete in place, before the Engineer selects any additional splices from this lot for further testing.

Whenever any lot of ultimate butt splices is rejected, additional ultimate butt splices shall not be used in the work until 1) the QCM performs a complete review of the Contractor's quality control process for these splices, 2) a written report is submitted to the Engineer describing the cause of failure for the splices in this lot and provisions for correcting these failures in future lots, and 3) the Engineer has provided the Contractor with written notification that the report is acceptable. The Engineer shall have 3 working days after receipt of the report to provide notification to the Contractor. Should the Engineer not provide notification within this time allowance, and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of this action, the delay will be considered a right of way delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

Production tests will not be required on any repaired splice from a lot, regardless of the type of prequalified ultimate mechanical butt splice used to make the repair.

Should an additional production test be required, the Engineer may select any repaired splice for use in the additional production test.

QUALITY ASSURANCE TEST REQUIREMENTS FOR ULTIMATE BUTT SPLICES

For the first production test performed, and for at least one, randomly selected by the Engineer, of every 5 additional production tests, or portion thereof, performed thereafter, the Contractor shall concurrently prepare 4 additional ultimate job control sample splices along with associated control bars. These ultimate job control samples shall be prepared in the same manner as specified herein for ultimate prejob sample splices and control bars.

Each time 4 additional ultimate job control sample splices are prepared, 2 of these job control sample splice and associated control bar sets and 2 of the production sample splice and associated control bar sets, together, shall conform to

the requirements for ultimate production sample splices in "Production Test Requirements for Ultimate Butt Splices" specified herein.

The 2 remaining job control sample splice and associated control bar sets, along with the 2 remaining production sample splice and associated control bar sets shall be shipped, unless otherwise directed in writing by the Engineer, to the Transportation Laboratory for quality assurance testing. The 4 sets shall be securely bundled together and identified by location and contract number with weatherproof markings prior to shipment. Bundles containing fewer than 4 sets will not be tested.

Quality assurance testing will be performed in conformance with the requirements for ultimate production sample splices in "Production Test Requirements for Ultimate Butt Splices" specified herein.

Test results for each bundle of 4 sets will be reported in writing to the Contractor within 3 working days after receipt of the bundle by Transportation Laboratory. In the event that more than one bundle is received on the same day, 2 additional working days shall be allowed for providing test results for each additional bundle received. A test report will be made for each bundle received. Should the Contractor elect to encase any splices prior to receiving notification from the Engineer, it is expressly understood that the Contractor will not be relieved of the Contractor's responsibility for incorporating material in the work that conforms to the requirements of the plans and specifications. Any material not conforming to these requirements will be subject to rejection. Should the Contractor elect to wait to encase any splices pending notification by the Engineer, and should the Engineer fail to complete the review and provide notification within this time allowance, and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in notification, the delay will be considered a right of way delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

EPOXY-COATED PREFABRICATED REINFORCEMENT

Bar reinforcement to be epoxy-coated shall conform to the ASTM Designation and grade required or permitted by Section 52-1.02A, "Bar Reinforcement," for the location or type of structure involved. The coated bar reinforcement shall conform to the requirements in ASTM Designation: A 934/A 934M except as provided herein.

Wire reinforcement to be epoxy-coated shall conform to the ASTM Designation and grade required or permitted by Section 52-1.02D, "Reinforcing Wire and Plain Bars," for the location or type of structure involved. The coated wire reinforcement shall conform to the requirements for Class A, Type 2 coating of ASTM Designation: A 884/A 884M except as provided herein.

Appendices X1 and X2, "Guidelines For Job-Site Practices," of ASTM Designation: A 884/A 884M and A 934/A 934M, respectively, shall apply except as provided herein. The term "shall" shall replace the term "should" in these appendices. Section X1.2 of Appendix X1 and Section X2.2 of Appendix X2 shall not apply.

All coatings shall be purple or gray in color.

Except for field welding of butt splices, all welding of reinforcement shall be complete prior to epoxy coating the reinforcement.

Bending of epoxy-coated reinforcement after the coating has been applied will not be allowed.

When any portion of a reinforcing bar or wire requires epoxy coating, the entire bar or wire shall be coated; except, when the bar or wire is spliced outside of the limits of epoxy coating shown on the plans, epoxy coating will not be required on the portion of bar or wire beyond the splice.

Within areas where epoxy-coated reinforcement is required, tie wire and bar chairs or other metallic devices used to secure or support the reinforcement shall be plastic-coated or epoxy-coated to prevent corrosion of the devices or damage to the coated reinforcement. The Contractor's attention is directed to the additional requirements for bar reinforcing supporting devices in the footings and within the splash zone elsewhere in these special provisions.

Prior to coating, the Contractor shall furnish to the Transportation Laboratory a representative 110 g sample from each batch of epoxy coating material to be used. Each sample shall be packaged in an airtight container identified with the manufacturer's name and batch number.

Two 700-mm long samples of coated bar or wire reinforcement from each size and from each load shipped to the jobsite shall be furnished to the Engineer for testing. These samples shall be representative of the material furnished. These samples, as well as any additional random samples taken by the Engineer, may be tested for specification compliance. Additional sampling, and all tests performed by the Engineer, may be performed at any location deemed appropriate by the Engineer. Failure of any sample to meet the requirements of the specifications will be cause for rejection.

If any bar tested for coating thickness or for adhesion of coating fails to meet the requirements for coated bars in Section 9 of ASTM Designation: A 934/A 934M, 2 retests on random samples taken from bars represented by the failed test will be conducted for each failed test. If the results of both retests meet the specified requirements, the coated bars represented by the samples may be certified as meeting the test requirements.

If any wire reinforcement tested for coating thickness or for flexibility fails to meet the requirements for coated wire in Section 8 of ASTM Designation: A 884/A 884M, 2 retests on random samples taken from wire represented by the failed test

will be conducted for each failed test. If the results of both retests meet the specified requirements, the coated wire represented by the samples may be certified as meeting the test requirements.

Epoxy-coated reinforcement shall be covered with an opaque polyethylene sheeting or other suitable protective material to protect the reinforcement from exposure to sunlight, salt spray and weather. For stacked bundles, the protective covering shall be draped around the perimeter of the stack. The covering shall be adequately secured; however, it should allow for air circulation around the reinforcement to prevent condensation under the covering. Epoxy-coated reinforcement shall not be stored within 300 meters of ocean or tidal water for more than 2 months.

All visible damage to coatings caused by shipping, handling or installation shall be repaired as required for repairing coating damaged prior to shipment conforming to the requirements in ASTM Designation: A 934/A 934M for bar reinforcement or ASTM Designation: A 884/A 884M for wire reinforcement. When the extent of coating damage prior to repair exceeds 2 percent of the bar or wire surface area in any 300-mm length, repair of the bar or wire will not be allowed and the coated bar or wire will be rejected.

The patching material and process shall be suitable for field application. The patching material shall be prequalified as required for the coating material and shall be either identified on the container as a material compatible with the reinforcement coating, or shall be accompanied by a Certificate of Compliance certifying that the material is compatible with the reinforcement coating. Damaged areas shall be patched in conformance with the patching material manufacturer's recommendations.

Except for lap splices, all splices for epoxy-coated reinforcement shall be coated with a corrosion protection covering that is on the Department's list of approved products. The covering shall be installed in conformance with the manufacturer's recommendations and as directed by the Engineer. The list is available from the Transportation Laboratory.

A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," shall be furnished for each shipment of epoxy-coated bar or wire reinforcement certifying that the coated bars or wire conform to the requirements in ASTM Designation: A 934/A 934M for bars or A 884/A 884M for wire and Section 52-1.02B, "Epoxy-coated Bar Reinforcement," of the Standard Specifications. This Certificate of Compliance shall include all the certifications specified in ASTM Designation: A 934/A 934M for bars or ASTM Designation: A 884/A 884M for wire and a statement that the coating material has been prequalified by acceptance testing performed by the Valley Forge Laboratories, Inc., Devon, Pennsylvania.

MEASUREMENT AND PAYMENT

Measurement and payment for reinforcement in structures shall conform to the provisions in Section 52-1.10, "Measurement," and Section 52-1.11, "Payment," of the Standard Specifications and these special provisions.

Full compensation for embedded mechanical butt splices required for extending reinforcing in the future, where shown on the plans, shall be included in the contract price paid per kg for bar reinforcing steel (bridge) or bar reinforcing steel (bridge, epoxy coated) and no additional compensation will be allowed therefor.

Any portion of bar or wire reinforcement extending beyond the limits for epoxy coated reinforcement shown on the plans will be measured and paid for as bar reinforcing steel (bridge).

10-1.57 WELDED HEADED BAR REINFORCEMENT

Welded headed bar reinforcement, consisting of furnishing and friction welding heads onto one or both ends of bar reinforcement, shall conform to the details shown on the plans, the provisions of Section 52, "Reinforcement," of the Standard Specifications and these special provisions.

Attention is directed to "Integrated Drawings" of these special provisions.

GENERAL

Prior to performing any manufacturing, the Contractor shall submit to the Engineer the manufacturer's Quality Control Manual (QCM) for the fabrication of welded headed bar reinforcement. As a minimum, the manual shall include the following:

- A. The pre-production procedures for the qualification of materials and equipment;
- B. The methods and frequencies for performing all quality control procedures during production;
- C. The calibration procedures and calibration frequency for all equipment;
- D. A system for the identification and tracking of all welds. The system shall have provisions for permanently identifying each weld and the parameters used to perform it;
- E. The welding procedure specification (WPS); and
- F. A system for marking welded headed bar reinforcement.

A daily production log for the manufacture of welded headed bar reinforcement shall be kept by the manufacturer for each day of production. The log shall clearly indicate the production lot numbers, the heats of bar material and head material

used in the manufacture of each production lot, the number of bars in each production lot, welding records, including tracking and production parameters for all welds, and results of all tests performed. A test report shall be furnished by the manufacturer containing, on a per heat basis, the chemical analysis of the bar and of the head material, including all elements represented in the carbon equivalent formula in ASTM Designation: A 706/A 706M, in addition to phosphorus and sulfur.

A production lot of welded headed bar reinforcement is defined as 150 reinforcing bars, or fraction thereof, of the same bar size, with welded heads of the same size and type, produced from bar material of a single heat number and head material of a single heat number. A new production lot shall be started if the heat number of either the bar material or the head material changes before the maximum production lot size of 150 is reached.

The daily production log shall be submitted in writing to the Engineer within 7 calendar days following the manufacture of any welded headed bar reinforcement.

The manufacturer shall furnish certificates of compliance to the Engineer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," for all material used in the manufacture of welded headed bar reinforcement.

MATERIALS AND MANUFACTURE

All bar reinforcement to be used in the fabrication of welded headed bar reinforcement shall conform to the provisions of "Reinforcement" of these special provisions.

Heads to be used in the fabrication of welded headed bar reinforcement shall be forge formed or cut from properly identified heats of mold cast or strand cast steel using the open-hearth, basic oxygen or electric-furnace process. The chemical composition of the heads shall conform to the requirements in ASTM Designation: A 29/A 29M, A 36/A 36M, A 108 Grade 1018, A 304, A 572/A 572M, or A 706/A 706M. Forging of heads shall conform to the requirements in ASTM Designation: A 788. Heads cut from plate shall conform to the provisions of Section 55, "Steel Structures," of the Standard Specifications.

Welding, welder qualifications, and inspection of welding shall conform to the requirements for friction welding in ANSI/AWS C6.1.

All welding shall be performed at an established and permanent fabrication facility.

All equipment used to perform friction welding shall be fitted with an effective in-process monitoring system to record essential production parameters that describe the process of welding the head onto the bar reinforcement. As a minimum, the parameters to be recorded shall include friction welding force, forge force, rotational speed, friction upset distance and time, forge upset distance and time, and other elements of the production process. The data from this in-process monitoring shall be recorded and preserved by the manufacturer and shall be provided to the Engineer upon request.

Heads shall be forge formed or cut from plate into a round, elliptical, or rectangular shape. Nominal head dimensions to be used for standard bar sizes shall conform to the following:

Nominal Head Dimensions			
Standard Bar Designation No.	Min. thickness mm	Min. cross-sectional area mm ²	Min. width mm
10	10	710	19
13	11	1 290	22
16	12	2 000	25
19	14	2 840	35
22	16	3 870	37
25	16	5 100	40
29	18	6 450	43
32	20	8 200	51
36	22	9 700	55
43	32	14 500	65
57	40	25 800	80
Notes: (1) These head dimensions are based on concrete compressive strength of 30 MPa. (2) The head thickness shall be measured parallel to the reinforcing bar longitudinal axis, and the head width shall be measured perpendicular to the reinforcing bar axis. (3) The cross-sectional area of the head shall be the projected area measured perpendicular to the axis of the bar.			

The Contractor may request, in writing, to use alternative head dimensions to those specified herein. The alternative head dimensions shall be designed using the concrete compressive strength shown on the plans. Alternative head dimensions will not be considered for approval unless it can be proven by the Contractor that the alternative heads have been successfully

produced and have had at least 2 years of satisfactory service in conditions similar to this application. The Contractor shall furnish, at the Contractor's expense, documentation satisfactory to the Engineer that the alternative head dimensions are suitable for the intended application. The documentation shall include, but not be limited to, calculations and test reports showing the following:

- A. The alternative head is capable of resisting the nominal tensile strength of the reinforcing bar when the bar reinforcement with welded head is embedded in concrete; and
- B. Shear or bending forces do not cause premature failure of the alternative head or crushing failure of the concrete under the alternative head.

Quality Control (QC) is the responsibility of the Contractor. As a minimum, the Contractor shall perform inspection and testing prior to welding, during welding and after welding and as necessary to ensure that materials and workmanship conform to the requirements of the specifications.

All equipment and materials for performing all pre-production and production testing shall be furnished by the Contractor at the Contractor's expense. All testing shall be performed 1) at the manufacturer's plant or at an approved laboratory, 2) in the presence of the Engineer, unless otherwise directed in writing, and 3) at the Contractor's expense.

Where welded headed bar reinforcement is shown on the plans to be epoxy coated, epoxy coating shall conform to the requirements of "Epoxy Coated Reinforcement" of these special provisions. Only round or elliptical heads shall be used for epoxy coated welded head bar reinforcement.

TENSILE TEST CRITERIA

Tensile testing of the welded headed bar reinforcement shall be performed in conformance with the requirements described in ASTM Designation: A 370.

Tensile test specimens shall be the full cross-section of the bar as rolled with a head attached to one end of the reinforcing bar. A specimen with a head welded to one end shall be placed in the testing machine with the head supported by a steel plate or other fixture to prevent movement and bending of the head. The fixture shall be placed concentrically with the longitudinal axis of the reinforcing bar directly against the flat inner surface of the head. The fixture shall provide clearance between the head support and the head-to-bar connection. Provisions shall be made for clearance between the support and any weld or forming material on the reinforcing bar-to-head connection. The free end of the bar, without a head attached, shall be gripped by the test machine.

All tensile test specimens for welded headed bar reinforcement shall conform to the following requirements:

- A. The tensile strength, yield strength and elongation shall conform to the requirements in Table 2, "Tensile Requirements," in ASTM Designation: A 706/A 706M;
- B. At rupture, there shall be no observed partial or total fracture of the head, the head-to-bar connection or the reinforcing bar within one bar diameter of the head-to-bar connection; and
- C. At rupture, there shall be visible signs of necking in the reinforcing bar, at a minimum distance of one bar diameter away from the head-to-bar connection.

PRE-PRODUCTION TESTING

Prior to production, successful test results from 3 tensile tests and 3 bend tests shall be furnished by the Contractor for each combination of 1) reinforcing bar size, 2) head size, 3) head type and, 4) head material specification to be used in the work. Bend tests will not be required for reinforcing bars Nos. 43 and 57.

Tensile tests shall conform to the requirements of "Tensile Test Criteria" of this section.

The bend tests shall be performed in conformance with the requirements described in ASTM Designation: A 706/A 706M, except that the test specimen shall be bent around a test mandrel to an angle of at least 90-degrees.

The mandrel shall be placed so as to directly bend the welded region. The mandrel dimensions for bend testing shall conform to the requirements for mandrel (pin) diameters in ASTM Designation: A 706/A 706M. The centerline of the bend test mandrel shall be placed at the intersection of the reinforcing bar and the weld.

Bend test specimens shall be the full cross-section of the bar as rolled with a head attached to one end of the reinforcing bar. For welded heads directly attached to the end of the reinforcing bar where the head interferes with placement of the bend test mandrel, sufficient head material and any excess material associated with the welding process shall be removed along one edge of the reinforcing bar to provide a flat surface on the specimen for the bend mandrel. For welded headed bar reinforcement where the head does not interfere with the positioning of the bend test mandrel, no specimen preparation shall be performed.

All welded headed bar reinforcement bend test specimens shall conform to the following requirements:

- A. There shall be no observed partial or total fracture of the head, the head-to-bar connection or the bar within one bar diameter of the head-to-bar connection; and
- B. There shall be no cracking on the outside of the bent portion.

PRODUCTION TESTING

Production testing shall be performed using samples that have been randomly selected by the Engineer from each production lot of welded headed bar reinforcement which is ready for shipment to the job site. The Engineer shall be notified in writing at least 7 days prior to conducting any tests.

A minimum of 3 samples of welded headed bar reinforcement from each production lot shall be tested. One tensile test shall be conducted on each sample.

All tensile test specimens shall conform to the requirements of "Tensile Test Criteria" of this section, except that if one of the test specimens fails to meet said requirements, one retest may be performed on one additional sample, selected by the Engineer, from the same production lot. Should this additional test specimen, or should more than one of the original test specimens, fail to meet said requirements, all welded headed bar reinforcement represented by the tests will be rejected in conformance with the provisions in Section 6-1.04, "Defective Materials," of the Standard Specifications.

All welded headed bar reinforcement of each bar size from each production lot to be shipped to the site shall be tagged in such a manner that each such production lot can be accurately identified at the job site. All unidentified welded headed bar reinforcement received at the job site will be rejected.

Marking

All welded headed bar reinforcement shall be identified by a distinguishing set of marks legibly stamped onto the flat outer side of the head, away from the bar, to denote the following:

- A. Point of Origin--Letter or symbol established as the manufacturer's designation.
- B. Type of Welded Headed Reinforcing Bar--Letter T indicating that the welded headed bar reinforcement was produced to this specification.

MEASUREMENT AND PAYMENT

Quantities of welded headed bar reinforcement will be measured as units determined from the number of welded heads shown on the plans or as directed by the Engineer.

The contract unit price paid for welded headed bar reinforcement or welded headed bar reinforcement(epoxy coated) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing heads and friction welding heads to bar reinforcement, including conforming to all testing requirements, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Bar reinforcement to be used in the manufacture of welded headed bar reinforcement will be measured and paid for as specified in Section 52, "Reinforcement," of the Standard Specifications, except that the lengths to be used in the computation of calculated weights of the bar reinforcement shall be the entire length of the welded headed bar, including heads.

Full compensation for placing the completed welded headed bar reinforcement into the work shall be considered as included in the contract price paid per kilogram for the bar reinforcement involved and no additional compensation will be allowed therefor.

10-1.58 ANCHOR PLATES

Anchor plates on reinforcing bars, called anchor plate assemblies, shall be placed in accordance with the details shown on the plans and the requirements in these special provisions.

Attention is directed to "Integrated Drawings" of these special provisions.

Anchor plates shall be used only at the locations and on the size of reinforcing bar shown on the plans.

The dimensions of the bearing surface of anchor plates for each size of reinforcing bar shall be not less than shown on the plans.

When connections are welded, anchor plates shall be fabricated from hot-rolled structural steel containing not more than 0.35 percent carbon. When connections are threaded, anchor plates shall be fabricated from structural steel plate.

Anchor plates shall be joined to reinforcing bars either by welding or by mechanical means at the option of the Contractor. Completed anchor plate assemblies shall develop not less than the minimum tensile strengths specified in the fourth paragraph of Section 52-1.08, "Splicing," of the Standard Specifications. Welded and mechanical connections between anchor plates and reinforcing bars shall conform to the provisions for splices in said Section 52-1.08 and these special provisions. In addition to the electrodes specified in Section 52-1.08B, "Butt Welded Splices," of the Standard Specifications, anchor plates may be welded to Grade 400 reinforcing bars with E 80, low hydrogen electrodes.

Connections between anchor plates and reinforcing bars shall be of approved design. New designs of all types shall be approved, prior to use, in conformance with the requirements for approval in Section 52-1.08C, "Mechanical Butt Splices," of the Standard Specifications.

Operator and procedure qualification tests for anchor plate assemblies shall consist of 2 sample assemblies and shall conform to the provisions for splices in Section 52-1.08D, "Qualification of Welding and Mechanical Splicing," of the Standard Specifications and these special provisions.

Acceptance of anchor plate assemblies will be based upon qualification tests performed prior to making anchor plate assemblies to be used in the work. Such tests shall consist of the fabrication and testing by the Contractor of sample anchor plate assemblies, and shall include testing performed by the Engineer on all anchor plate assemblies. Completed samples of anchor plate assemblies shall be at least one meter long. Acceptable sample anchor plate assemblies shall conform to the requirements in this section.

Sample anchor plate assemblies shall be tested in tension with the anchor plate bearing on a solid steel support, except for a hole in the support providing a loose fit for the reinforcing bar. Testing procedure requires that each assembly be fabricated such that the anchor plate does not vary from a right angle to the bar axis by more than about one degree.

When cut-out control sample splices are ordered by the Engineer, the work involved in said sampling will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

Anchor plates on reinforcing bars will be paid for at the contract price per kilogram for bar reinforcing steel (bridge).

The mass of the anchor plates has been computed from the dimensions of the anchor plates shown on the plans and this mass has been included in the quantity of bar reinforcing steel as shown on the plans.

10-1.59 STRAY CURRENT MONITORING POINTS

This work shall consist of connecting stray current monitoring points to reinforcing bars. The work shall be in accordance with the details shown on the plans and as specified in these special provisions.

BAR REINFORCING STEEL CONNECTION

Electrical interconnection of the bar reinforcing shall be with collector bars, welded connection bars, and welded splices of straight bars as shown on the plans.

Welding of bars and splices shall be done by the manual shielded metal-arc process prior to installation of the prestressing strands. Low hydrogen electrodes conforming to the requirements of AWS A5.1 for E7016 electrodes shall be used.

Reinforcing bars used for stray current connections shall conform to the provisions in "Reinforcement" in these special provisions.

COPPER CABLE TO BAR REINFORCING STEEL CONNECTION

The copper cable shall be fusion welded to the bar reinforcing steel by an exothermic type welding process as shown on the plans. Materials used shall be in accordance with the manufacturer's recommendations regarding the mold size and shape, and the charge size and alloy mixture for the powder.

The copper cable shall conform to the provisions in Section 86-2.08B, "Multiple Circuit Conductors," of the Standard Specifications.

Rubber splicing compound, commercially available, shall be applied to the welded connection.

Apply 2 layers of tape, each half lapped. The tape shall be commercially available vinyl electrical tape with minimum thickness of 175 μ m.

The test box cover and anchorage devices shall conform to the provisions in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications. The gasket shall be of commercially available neoprene.

PAYMENT

Except as otherwise provided, full compensation for connecting stray current monitoring points to reinforcing bars shall be considered as included in the contract prices paid for the various contract items of work involved and no additional compensation will be allowed therefor.

10-1.60 INTEGRATED DRAWINGS

The Contractor shall prepare electronic integrated and composite drawings in accordance with the requirements of these special provisions. Integrated and composite drawings are working drawings showing all details, all disciplines of work features embedded in the structural concrete. The intent of the integrated drawings is to show and prove compatibility of all materials within the concrete but also to aid the Contractor in assembling congested areas prior to concrete placement.

Drawings shall be prepared to scale and in sufficient detail to show the relative positions of all items that are embedded in the concrete and their embedded depth for the locations specified. Such embedded items include: the post-tensioning ducts,

vents, anchorage reinforcement and hardware, bar reinforcing steel, anchor bolts, deck joint seal assemblies, drainage systems, utility conduits and openings, traveler inserts or bolt sleeves and other items. The integrated drawings shall be adequate to ensure that there will be no conflict between the planned positions of any embedded items and that the concrete cover meets the requirements in the Standard Specifications and that shown on the drawings. The Contractor shall utilize commercially available interference checking software, compatible with the CAD software used in creating the drawings, to review the drawings for conflicts. Bar reinforcing shall be shown with assigned thicknesses which account for the deformations on the bars. Elements shall be created for the prestressing jacks so that clearances can be checked during stressing of tendons and during positioning of jacks. The Contractor's CAD files shall be built up using layers so that the sequence of construction of the area being detailed can be shown sequentially.

If during the preparation of such drawings conflicts are discovered, the Contractor shall revise one or more of the embedded items in the working drawings where such items are not detailed by the contract drawings (such as prestressing anchorage details) and/or propose changes from the contract drawings where the items are detailed on the plans (such as bar reinforcing details). Any changes from the contract drawings necessary to eliminate interferences shall be approved by the Engineer before work on the affected item is started. The Contractor's attention is directed to the requirements regarding allowable changes to the contract plans elsewhere in these special provisions.

As a minimum, the following working drawings shall be prepared:

1. An integrated drawing for each typical pier diaphragm(Piers 3,16 and 17).
2. An integrated drawing for each typical pier table(Piers 5,7,10,13 and 15).
3. An integrated drawing for representative superstructure segments, adjacent to the Pier tables at Pier 5,7,10,13 and 15 and adjacent to hinges C through E.
4. An integrated drawing for each expansion joint including the blockout area.
5. An integrated drawing for the area of the bridge south of Pier 17 including the top slab anchorages and the east and west girders.
6. An integrated drawing for the supporting side of each hinge at Hinges A,B and E.
7. An integrated drawing for the supported side of each hinge at Hinges A and B.
8. An integrated drawing for each of the following typical areas:

a. a bottom slab span tendon anchorage

A. a pilaster future tendon deviator including the bottom slab

Proof of the Contractor's preparation of the integrated drawings shall be submitted as paper copy isometric views of the required areas. Drawings shall be 559x864 mm in size and shall use colored ink to differentiate each type of embedded element. As a minimum, two isometric views for each integrated working drawing shall be submitted. The isometrics shall be 90 degrees apart.

The Contractor shall submit isometric views from integrated drawings for review to the Resident Engineer's Office 757 Arnold Drive, Suite 200 Martinez, California 94553 at telephone number (925) 646-1996, for approval in accordance with the provisions in Section 5-1.02, "Plans and Working Drawings". For initial review, 10 sets shall be submitted. After review, between 6 and 12 sets, as requested by the Engineer, shall be submitted to said Office for final approval and for use during construction.

The time to be provided for the Engineer's review of the working drawings for specific structures, or portions thereof, shall be as follows:

Structure or Portion of Structure	Review Time (Weeks)
An integrated drawing for each typical pier diaphragm(Piers 3,16 and 17).	4
An integrated drawing for each typical pier table(Piers 5,7,10,13 and 15).	4
An integrated drawing for representative superstructure segments, adjacent to the Pier tables at Pier 5,7,10,13 and 15 and adjacent to hinges C through E	4
An integrated drawing for each expansion joint including the blockout area	4
An integrated drawing for area of the bridge south of Pier 17 including the top slab anchorages and the east and west girders	4
An integrated drawing for the supporting side of each hinge at Hinges A,B and E	4
An integrated drawing for the supported side of each hinge at Hinges A and B	4
An integrated drawing for each of the following typical areas: a bottom slab span tendon anchorage and a pilaster future tendon deviator including the bottom slab	4

Submittal of isometric drawings made from integrated drawings shall in no way relieve the Contractor from any other working drawing submittals required by these special provisions or the Standard Specifications.

Two-dimensional MicroStation files of the contract drawings will be made available to the Contractor, upon request, for use in preparing the integrated drawings. Use of the Engineer's electronic drawings shall be at the sole risk of the Contractor. The Contractor shall verify all dependent dimensions before ordering or fabricating any materials. The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of the contract drawings.

In addition to the paper isometric drawing submittals required by this special provision, when requested by the Engineer, the Contractor shall submit two copies of the integrated drawings in electronic form on compact discs or tape for use by the State. If requested by the Engineer, the Contractor shall demonstrate the assembly of complicated areas represented by the integrated drawings specified herein. Demonstrations shall be on a large color monitor and shall be conducted at an office in the San Francisco Bay Area.

The Contractor shall be responsible for all coordination necessary between the various subcontractors involved in preparing the integrated drawings. No time extensions shall be allowed for whatever reason for the Contractor's failure to complete the integrated drawings as required by these special provisions.

Full compensation for furnishing the integrated and composite drawings in accordance with these special provisions, including all revisions necessary due to interference mitigation, as directed by the Engineer, shall be considered as included in the prices paid for the various items of work shown in the Engineer's estimate and no additional compensation will be allowed therefor.

10-1.61 STEEL STRUCTURES

Construction of steel structures shall conform to the provisions in Section 55, "Steel Structures," of the Standard Specifications and these special provisions.

The second paragraph of Section 55-1.01, "Description," of the Standard Specifications is amended to read:

- The Contractor shall furnish, fabricate, and erect the structural steel or metalwork, construct and remove the temporary construction, and do all work required to complete the bridge or bridges.

GENERAL

Structural steel shall consist of the following:

- A. Steel Box Girders at Hinges C and D
- B. Steel Plate Girders at Hinges C and D
- C. Steel Ring Forms at Footings

The following paragraph is added after the first paragraph of Section 55-1.02, "Drawings," of the Standard Specifications:

The Contractor's WPS's, QCP's and FCP's shall be submitted for review and approval prior to any structural steel working drawings being submitted. All working drawing submitted shall identify the specific approved WPS's that are applicable to each working drawing.

Attention is directed to "Welding Quality Control" of these special provisions.

The following substitutions of high-strength steel fasteners shall be made:

METRIC SIZE SHOWN ON THE PLANS	IMPERIAL SIZE TO BE SUBSTITUTED
ASTM Designation: A 325M (Nominal bolt diameter and thread pitch (mm))	ASTM Designation: A 325 (Nominal bolt diameter (inch))
M16 x 2	5/8
M20 x 2.5	3/4
M22 x 2.5	7/8
M24 x 3	1
M27 x 3	1 1/8
M30 x 3.5	1 1/4
M36 x 4	1 1/2

The steel box girders and steel plate girders at Hinges C and D shall be considered fracture critical members. The flanges of the steel box girders and the steel plate girders are subject to both tension and compression forces. Steel for fracture critical members, shall conform to the requirements in ANSI/AASHTO/AWS D1.5, Section 12, "AASHTO/AWS Fracture Control Plan (FCP) for Non-Redundant Members." Charpy V-notch (CVN) impact values for fracture critical members shall conform to the requirements for Zone 2.

MATERIALS

Structural steel rolled shapes used in steel box girders and steel plate girders shall conform to the Charpy V-notch impact values specified for steel plate in Section 55-2, "Materials," of the Standard Specifications.

High-strength fastener assemblies, and other bolts attached to structural steel with nuts and washers shall be zinc-coated. When direct tension indicators are used in these assemblies, the direct tension indicator and all components of the fastener assembly shall be zinc-coated by the mechanical deposition process.

CHECK TESTING

Structural steel shall conform to the designated ASTM Standard and the check testing requirements of this section and those of Section 55-2, "Materials," of the Standard Specifications with regard to frequency of testing.

Check samples shall be furnished for each heat of maximum thickness of:

- A. Tension flanges and webs of fracture critical members.

Steel plates, shapes or bars containing check samples shall be furnished from the mill with extra length in order to provide for removal of material for check samples at the point of fabrication. Check samples may be cut from either end of the designated plate, shape or bar.

At the option of the Contractor, check samples may be removed at the rolling mill rather than at the point of fabrication. The sample will be removed from the mill plate that will be stripped by the fabricator to produce the designated plate and may be taken from any location within that plate. The mill plate from which samples are removed shall be marked with the same identifying numbers as are used on the samples.

Unless otherwise directed, material for check samples shall be removed by the Contractor in the presence of the Engineer. Check samples for plates wider than 610 mm shall be 355 mm wide and 460 mm long with the long dimension transverse to the direction of rolling. Check samples for all other products shall be 460 mm long, taken in the direction of rolling, and the width shall be the product width. Check samples shall be removed and delivered to the Engineer before the material is fabricated into components and preferably when it is still being prepared for fabrication. The direction of rolling, heat numbers, and plate numbers shall be marked on the samples with paint or other indelible marking material or may be steel stamped in one corner of the plate.

Unless otherwise directed, check samples shall be delivered to the Transportation Laboratory at the Contractor's expense. The check samples will be tested by the Transportation Laboratory for compliance with the requirements specified in ASTM and these special provisions. Check sample test results will be reported to the Contractor within 10 working days of delivery to the Transportation Laboratory. In the event several samples are submitted on the same day, an additional day will be added for each 2 samples submitted. The test report will be made for the group of samples.

The results of the tensile and impact tests shall not vary more than 5 percent below the specified minimum or 5 percent above the specified maximum requirements except that if the initial check test results vary more than 5 percent but not more than 10 percent from the specified requirements, a retest may be performed on another sample from the same heat and thickness. The results of the retest shall not vary more than 5 percent from the original specified requirements. If the results of check tests exceed these permissible variations, material planned for use from the heat represented by said check samples shall be subject to rejection.

Section 55-3.14, "Bolted Connections," of the Standard Specifications is amended by adding the following after the ninth paragraph:

- If a torque multiplier is used in conjunction with a calibrated wrench as a method for tightening fastener assemblies to the required tension, both the multiplier and the wrench shall be calibrated together as a system. The same length input and output sockets and extensions that will be used in the work shall also be included in the calibration of the system. The manufacturer's torque multiplication ratio shall be adjusted during calibration of the system, such that when this adjusted ratio is multiplied by the actual input calibrated wrench reading, the product is a calculated output torque that is within 2 percent of the true output torque. When this system is used in the work to perform any installation tension testing, rotational capacity testing, fastener tightening, or tension verification, it shall be used, intact as calibrated.

ROTATIONAL CAPACITY TESTING PRIOR TO SHIPMENT TO JOB SITE

Rotational capacity tests shall be performed on all lots of high-strength fastener assemblies prior to shipment of these lots to the project site. Zinc-coated assemblies shall be tested after all fabrication, coating, and lubrication of components has been completed. One hardened washer shall be used under each nut for the tests.

Each combination of bolt production lot, nut lot and washer lot shall be tested as an assembly.

A rotational capacity lot number shall be assigned to each combination of lots tested. Each shipping unit of fastener assemblies shall be plainly marked with the rotational capacity lot number.

Two fastener assemblies from each rotational capacity lot shall be tested.

The following equipment, procedure, and acceptance criteria shall be used to perform rotational capacity tests on, and determine acceptance of long bolts. Fasteners are considered to be long bolts when full nut thread engagement can be achieved when installed in a bolt tension measuring device:

A. Long Bolt Test Equipment:

1. Calibrated bolt tension measuring device with adequate tension capacity for the bolts being tested.
2. Calibrated dial or digital torque wrench. Other suitable tools will be required for performing Steps 7 and 8 of the Long Bolt Test Procedure. A torque multiplier may be required for large diameter bolts.
3. Spacer washers or bushings. When spacer washers or bushings are required, they shall have the same inside diameter and equal or larger outside diameter as the appropriate hardened washers conforming to the requirements in ASTM Designation: F436.

4. Steel beam or member, such as a girder flange or cross frame, to which the bolt tension measuring device will be attached. The device shall be accessible from the ground.

B Long Bolt Test Procedure:

1. Measure the bolt length. The bolt length is defined as the distance from the end of the threaded portion of the shank to the underside of the bolt head.
2. Install the nut on the bolt so that 3 to 5 full threads of the bolt are located between the bearing face of the nut and the underside of the bolt head. Measure and record the thread stickout of the bolt. Thread stickout is determined by measuring the distance from the outer face of the nut to the end of the threaded portion of the shank.
3. Insert the bolt into the bolt tension measuring device and install the required number of washers, and additional spacers as needed, directly beneath the nut to produce the thread stickout measured in Step 2 of this procedure.
4. Tighten the nut using a hand wrench to a snug-tight condition. The snug tension shall not be less than the Table A value but may exceed the Table A value by a maximum of 2 kips.

Table A

High-Strength Fastener Assembly Tension Values to Approximate Snug-Tight Condition	
Bolt Diameter (inches)	Snug Tension (kips)
1/2	1
5/8	2
3/4	3
7/8	4
1	5
1 1/8	6
1 1/4	7
1 3/8	9
1 1/2	10

5. Match-mark the assembly by placing a heavy reference start line on the face plate of the bolt tension measuring device which aligns with 1) a mark placed on one corner of the nut, and 2) a radial line placed across the flat on the end of the bolt, or on the exposed portions of the threads of tension control bolts. Place an additional mark on the outside of the socket that overlays the mark on the nut corner such that this mark will be visible while turning the nut. Make an additional mark on the face plate, either 2/3 of a turn, one turn, or 1 1/3 turn clockwise from the heavy reference start line, depending on the bolt length being tested as shown in Table B.

Table B

Required Nut Rotation for Rotational Capacity Tests ^(a,b)	
Bolt Length (measured in Step 1)	Required Rotation (turn)
4 bolt diameters or less	2/3
Greater than 4 bolt diameters but no more than 8 bolt diameters	1
Greater than 8 bolt diameters, but no more than 12 bolt diameters ^(c)	1 1/3
<p>(a) Nut rotation is relative to bolt, regardless of the element (nut or bolt) being turned. For bolts installed by 1/2 turn and less, the tolerance shall be plus or minus 30 degrees; for bolts installed by 2/3 turn and more, the tolerance shall be plus or minus 45 degrees.</p> <p>(b) Applicable only to connections in which all material within grip of the bolt is steel.</p> <p>(c) When bolt length exceeds 12 diameters, the required rotation shall be determined by actual tests in a suitable tension device simulating the actual conditions.</p>	

6. Turn the nut to achieve the applicable minimum bolt tension value listed in Table C. After reaching this tension, record the moving torque, in foot-pounds, required to turn the nut, and also record the corresponding bolt tension value in pounds. Torque shall be measured with the nut in motion. Calculate the value, T (in ft-lbs), where $T = [(\text{the measured tension in pounds}) \times (\text{the bolt diameter in inches}) / 48 \text{ in/ft}]$.

Table C

Minimum Tension Values for High-Strength Fastener Assemblies	
Bolt Diameter (inches)	Minimum Tension (kips)
1/2	12
5/8	19
3/4	28
7/8	39
1	51
1 1/8	56
1 1/4	71
1 3/8	85
1 1/2	103

7. Turn the nut further to increase bolt tension until the rotation listed in Table B is reached. The rotation is measured from the heavy reference line made on the face plate after the bolt was snug-tight. Record this bolt tension.
8. Loosen and remove the nut and examine the threads on both the nut and bolt.

C. Long Bolt Acceptance Criteria:

1. An assembly shall pass the following requirements to be acceptable: 1) the measured moving torque (Step 6) shall be less than or equal to the calculated value, T (Step 6), 2) the bolt tension measured in Step 7 shall be greater than or equal to the applicable turn test tension value listed in Table D, 3) the nut shall be able to be removed from the bolt without signs of thread stripping or galling after the required rotation in Step 7 has been achieved, 4) the bolt does not shear from torsion or fail during the test and 5) the assembly does not seize before

the final rotation in Step 7 is reached. Elongation of the bolt in the threaded region between the bearing face of the nut and the underside of the bolt head is expected and will not be considered a failure. Both fastener assemblies tested from one rotational capacity lot shall pass for the rotational capacity lot to be acceptable.

Table D

Turn Test Tension Values	
Bolt Diameter (inches)	Turn Test Tension (kips)
1/2	14
5/8	22
3/4	32
7/8	45
1	59
1 1/8	64
1 1/4	82
1 3/8	98
1 1/2	118

The following equipment, procedure and acceptance criteria shall be used to perform rotational capacity tests on and determine acceptance of short bolts. Fasteners are considered to be short bolts when full nut thread engagement cannot be achieved when installed in a bolt tension measuring device:

A. Short Bolt Test Equipment:

1. Calibrated dial or digital torque wrench. Other suitable tools will be required for performing Steps 7 and 8 of the Short Bolt Test Procedure. A torque multiplier may be required for large diameter bolts.
2. Spud wrench or equivalent.
3. Spacer washers or bushings. When spacer washers or bushings are required, they shall have the same inside diameter and equal or larger outside diameter as the appropriate hardened washers conforming to the requirements in ASTM Designation: F436.
4. Steel plate or girder with a hole to install bolt. The hole size shall be 1.6 mm greater than the nominal diameter of the bolt to be tested. The grip length, including any plates, washers, and additional spacers as needed, shall provide the proper number of threads within the grip, as required in Step 2 of the Short Bolt Test Procedure.

B. Short Bolt Test Procedure:

1. Measure the bolt length. The bolt length is defined as the distance from the end of the threaded portion of the shank to the underside of the bolt head.
2. Install the nut on the bolt so that 3 to 5 full threads of the bolt are located between the bearing face of the nut and the underside of the bolt head. Measure and record the thread stickout of the bolt. Thread stickout is determined by measuring the distance from the outer face of the nut to the end of the threaded portion of the shank.
3. Install the bolt into a hole on the plate or girder and install the required number of washers, and additional spacers as needed, between the bearing face of the nut and the underside of the bolt head to produce the thread stickout measured in Step 2 of this procedure.
4. Tighten the nut using a hand wrench to a snug-tight condition. The snug condition shall be the full manual effort applied to the end of a 305 mm long wrench. This applied torque shall not exceed 20 percent of the maximum allowable torque in Table E.

Table E

Maximum Allowable Torque for High-Strength Fastener Assemblies	
Bolt Diameter (inches)	Torque (ft-lbs)
1/2	145
5/8	285
3/4	500
7/8	820
1	1220
1 1/8	1500
1 1/4	2130
1 3/8	2800
1 1/2	3700

5. Match-mark the assembly by placing a heavy reference start line on the steel plate or girder which aligns with 1) a mark placed on one corner of the nut, and 2) a radial line placed across the flat on the end of the bolt, or on the exposed portions of the threads of tension control bolts. Place an additional mark on the outside of the socket that overlays the mark on the nut corner such that this mark will be visible while turning the nut. Make 2 additional small marks on the steel plate or girder, one 1/3 of a turn and one 2/3 of a turn clockwise from the heavy reference start line on the steel plate or girder.
6. Using the torque wrench, tighten the nut to the rotation value listed in Table F. The rotation is measured from the heavy reference line described in Step 5 made after the bolt was snug-tight. A second wrench shall be used to prevent rotation of the bolt head during tightening. Measure and record the moving torque after this rotation has been reached. The torque shall be measured with the nut in motion.

Table F

Nut Rotation Required for Turn-of-Nut Installation ^(a,b)	
Bolt Length (measured in Step 1)	Required Rotation (turn)
4 bolt diameters or less	1/3
(a) Nut rotation is relative to bolt, regardless of the element (nut or bolt) being turned. For bolts installed by 1/2 turn and less, the tolerance shall be plus or minus 30 degrees.	
(b) Applicable only to connections in which all material within grip of the bolt is steel.	

7. Tighten the nut further to the 2/3-turn mark as indicated in Table G. The rotation is measured from the heavy reference start line made on the plate or girder when the bolt was snug-tight. Verify that the radial line on the bolt end, or on the exposed portions of the threads of tension control bolts, is still in alignment with the start line.

Table G

Required Nut Rotation for Rotational Capacity Test	
Bolt Length (measured in Step 1)	Required Rotation (turn)
4 bolt diameters or less	2/3

8. Loosen and remove the nut and examine the threads on both the nut and bolt.

C. Short Bolt Acceptance Criteria:

1. An assembly shall pass the following requirements to be acceptable: 1) the measured moving torque from Step 6 shall be less than or equal to the maximum allowable torque from Table E, 2) the nut shall be able to be

removed from the bolt without signs of thread stripping or galling after the required rotation in Step 7 has been achieved, 3) the bolt does not shear from torsion or fail during the test and 4) the assembly shall not seize before the final rotation in Step 7 is reached. Elongation of the bolt in the threaded region between the bearing face of the nut and the underside of the bolt head will not be considered a failure. Both fastener assemblies tested from one rotational capacity lot shall pass for the rotational capacity lot to be acceptable.

INSTALLATION TENSION TESTING AND ROTATIONAL CAPACITY TESTING AFTER ARRIVAL ON THE JOB SITE

Installation tension tests and rotational capacity tests on high-strength fastener assemblies shall be performed by the Contractor prior to acceptance or installation, and after arrival of the fastener assemblies on the project site. Installation tension tests and rotational capacity tests shall be performed at the job-site, in the presence of the Engineer, on each rotational capacity lot of fastener assemblies.

Installation tension tests shall be performed on 3 representative fastener assemblies in conformance with the provisions in Section 8, "Installation and Tightening," of the RCSC Specification. For short bolts, Section 8(d), "Joint Assembly and Tightening of Slip-Critical and Direct Tension Connections," of the RCSC Specification shall be replaced by the "Pre-Installation Testing Procedures," of the "Structural Bolting Handbook," published by the Steel Structures Technology Center, Incorporated.

The rotational capacity tests shall be performed in conformance with the requirements for rotational capacity tests in "Rotational Capacity Testing Prior to Shipment to Job Site" of these special provisions.

At the Contractor's expense, additional installation tension tests, tests required to determine job inspecting torque and rotational capacity tests shall be performed by the Contractor on each rotational capacity lot, in the presence of the Engineer, if 1) any fastener is not used within 3 months after arrival on the jobsite, 2) fasteners are improperly handled, stored, or subjected to inclement weather prior to final tightening, 3) significant changes are noted in original surface condition of threads, washers or nut lubricant or 4) the Contractor's required inspection is not performed within 48 hours after all fasteners in a joint have been tensioned.

Failure of a job-site installation tension test or a rotational capacity test will be cause for rejection of unused fasteners that are part of the rotational capacity lot.

When direct tension indicators are used, installation verification tests shall be performed in conformance with Appendix Section X1.4 of ASTM Designation: F959, except that bolts shall be initially tensioned to a value 5 percent greater than the minimum required bolt tension.

SURFACE PREPARATION

For all bolted connections, the 1) contact surfaces and 2) inside surfaces of bolt holes shall be cleaned and coated before assembly in conformance with the provisions for cleaning and painting structural steel of these special provisions.

SEALING

The perimeter around all direct tension indicator gaps shall be completely sealed with non-silicone type sealing compound conforming to the provisions in Federal Specification TT-S-230, Type II. The sealant shall be gray in color and have a minimum thickness of 1.3 mm. If painting is required, the sealing compound shall be applied prior to painting.

When zinc-coated tension control bolts are used, the sheared end of each fastener shall be completely sealed with non-silicone type sealing compound conforming to the provisions in Federal Specification TT-S-230, Type II. The sealant shall be gray in color and shall have a minimum thickness of 1.3 mm. The sealant shall be applied to a clean sheared surface on the same day that the splined end is sheared off.

WELDING

Table 2.2 of ANSI/ AASHTO/AWS D1.5 is superseded by the following table:

Base Metal Thickness of the Thicker Part Joined, mm	Minimum Effective Partial Joint Penetration Groove Weld Size, * mm
Over 6 to 13 inclusive	5
Over 13 to 19 inclusive	6
Over 19 to 38 inclusive	8
Over 38 to 57 inclusive	10
Over 57 to 150 inclusive	13
Over 150	16

* Except the weld size need not exceed the thickness of the thinner part

STEEL BOX GIRDER AND STEEL PLATE GIRDER FABRICATION

After all welding is completed, the steel box beams and the steel plate girders shall be stress relieved by heat treating in accordance with AWS D1.5 Section 4.4. Alternately, the Contractor may propose special preheating, control of interpass temperatures and post heating (stress relief) using automated thermal control systems during fabrication, as included in a WPS prepared to control distortion and shrinkage such that the required tolerances are met. The Engineer shall be the sole judge of acceptability of alternate methods and his decision shall be final. After controlled cooling of the members, all holes shall be drilled and then the outer flanges of the steel box girders and plate girders shall be milled to a flatness of 1mm in any direction and parallel to one another within 1mm at any point along the length of the member. The Contractor shall submit a proposed method of verifying the flatness and parallelness of the members for approval by the Engineer. Attention is directed to "Welding Quality Control" of these special provisions for additional requirements concerning Fracture Critical Members and to the requirements for controlling the distortion and shrinkage in conjunction with the WPS submittals.

STEEL BOX GIRDER AND STEEL PLATE GIRDER INSTALLATION

Steel box girders and steel plate girders at Hinges C and D shall be installed in accordance with the details and sequence shown on the plans, as specified in these special provisions and as directed by the Engineer. Attention is directed to "Installing Bearings at Hinges C and D" elsewhere in these special provisions. Prior to placing the grout pads behind the bearing plates for the steel box girders, the Contractor shall verify that the box girders are placed parallel to each other. Measurements between the girders at each end of the girders shall be made by the Contractor using a steel tape or electronic measuring device. Measurements shall be made in the presence of the Engineer. The measurements at the two ends shall agree within 5mm or the Contractor shall readjust the beams to be more parallel. A temporary bracing system between the two steel box girders shall be used to maintain the beams in a parallel position until the vertical bearings are completely activated. Steel box girders shall not be supported on the bottom slab of the segments.

The steel plate girders shall be placed parallel to the bridge deck. Prior to placing the concrete or nonshrink grout in the closure pours for the steel plate girders, the Contractor shall verify that the plate girders are placed parallel to the bridge deck. Measurements between the top of the plate girders and the bottom of the top slab at each end of the girders shall be made by in the presence of the Engineer. The measurements at the two ends shall agree within 5mm or the Contractor shall readjust the plate girders to be more parallel to the deck. The Contractor shall also provide a means of determining the deck thickness at the two measuring points to confirm the deck was cast to the correct thickness. The Contractor shall not support the steel plate girders on the bottom slab of the segments. Stressing of the prestressing bars attaching the plate girder to Diaphragm A shall alternate from one side of the plate girder to the other so that the prestressing force is never more than one bar eccentric about the center line of the plate girder.

MEASUREMENT AND PAYMENT

If a portion of or all check samples are removed at a mill more than 480 air line kilometers from both Sacramento and Los Angeles, shop inspection expenses will be sustained by the State which are in addition to expenses incurred for fabrication site inspection. Payment to the Contractor for furnishing structural steel will be reduced \$2,000 for each mill located more than 480 air line kilometers from both Sacramento and Los Angeles.

Full compensation for steel rings in precast pier footings forms shall be considered as included in the contract unit price paid per cubic meter for precast pier footing form and no separate payment will be made therefor.

10-1.62 SIGN STRUCTURES

Sign structures and foundations for overhead signs shall conform to the provisions in Section 56-1, "Overhead Sign Structures," of the Standard Specifications.

10-1.63 CLEAN AND PAINT STRUCTURAL STEEL

Exposed new metal surfaces, except where galvanized, shall be cleaned and painted in conformance with the provisions in Section 59-2, "Painting Structural Steel," and Section 91, "Paint," of the Standard Specifications and these special provisions.

The ninth paragraph of Section 59-1.03, "Application," of the Standard Specifications is amended to read:

- Runs, sags, orange peeling, thin and excessively thick areas in the paint film, skips and holidays, or areas of non-uniform appearance shall be considered as evidence that the work is unsatisfactory, and the Contractor may be required to blast clean the areas and reapply the paint.

Coating manufacturer's painting guidelines which are more stringent than these special provisions shall govern over these special provisions, as determined by the Engineer.

Section 59-2.01, "General," of the Standard Specifications is amended by adding the following paragraph after the first paragraph:

- Unless otherwise specified, painting Contractors or subcontractors shall be required to have the following certifications from the "SSPC: The Society for Protective Coatings" (formerly the Steel Structures Painting Council), prior to performing the work:
 - A. For cleaning and painting of structural steel in the field, certification in conformance with the requirements in Qualification Procedure No. 1, "Standard Procedure For Evaluating Painting Contractors" (SSPC-QP 1).
 - B. For the removal of paint from structural steel, certification in conformance with the requirements in Qualification Procedure No. 2, "Standard Procedure For Evaluating The Qualifications of Painting Contractors To Remove Hazardous Paint" (SSPC-QP 2).
 - C. For cleaning and painting of structural steel in a permanent painting facility, certification in conformance with the requirements in Qualification Procedure No. 3, "Standard Procedure For Evaluating Qualifications of Shop Painting Contractors" (SSPC-QP 3). The AISC's Sophisticated Paint Endorsement (SPE) quality program will be considered equivalent to SSPC-QP 3.

The third paragraph of Section 59-2.03, "Blast Cleaning," of the Standard Specifications is amended to read:

- Exposed steel or other metal surfaces to be blast cleaned shall be cleaned in conformance with the requirements in Surface Preparation Specification No. 6, "Commercial Blast Cleaning," of the "SSPC: The Society for Protective Coatings." Blast cleaning shall leave all surfaces with a dense, uniform, angular anchor pattern of not less than 35 μm as measured in conformance with the requirements in ASTM Designation: D 4417.

The first paragraph of Section 59-2.06, "Hand Cleaning," of the Standard Specifications is amended to read:

- Dirt, loose rust and mill scale, or paint which is not firmly bonded to the surfaces shall be removed in conformance with the requirements in Surface Preparation Specification No. 2, "Hand Tool Cleaning," of the "SSPC: The Society for Protective Coatings." Edges of old remaining paint shall be feathered.

The fourth paragraph of Section 59-2.12, "Painting," of the Standard Specifications is amended to read:

- The dry film thickness of the paint will be measured in place with a calibrated Type 2 magnetic film thickness gage in conformance with the requirements of specification SSPC-PA2 of the "SSPC: The Society for Protective Coatings."

CLEANING

Exposed new metal surfaces shall be dry blast cleaned in conformance with the requirements in Surface Preparation Specification No. 10, "Near White Blast Cleaning," of the "SSPC: The Society for Protective Coatings." Blast cleaning shall leave surfaces with a dense, uniform, angular anchor pattern of not less than 40 μm nor more than 86 μm as measured in conformance with the requirements in ASTM Designation: D 4417.

Mineral and slag abrasives used for blast cleaning steel shall conform to the requirements in Abrasive Specification No. 1, "Mineral and Slag Abrasives," of the "SSPC: The Society for Protective Coatings" and shall not contain hazardous material. Mineral and slag abrasives shall comply with the requirements for Class A, Grade 2 to 3 as defined therein.

A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications and a Material Safety Data Sheet shall be furnished prior to use for each shipment of blast cleaning material for steel.

The inside surfaces of bolt holes shall be cleaned in conformance with the requirements in Surface Preparation Specification No. 1, "Solvent Cleaning," of the "SSPC: The Society for Protective Coatings," and visible rust shall be removed.

PAINTING

Blast cleaned surfaces shall receive a single undercoat, and a final coat where specified, consisting of a waterborne inorganic zinc coating conforming to the requirements in AASHTO Designation M 300, Type II, except that: 1) the first 3 sentences of Section 4.7, "Primer Field Performance Requirements," and the entire Section 4.7.1 shall not apply, and 2) zinc dust shall be Type II in conformance with the requirements in ASTM Designation: D 520. The inorganic zinc coating shall be listed on the qualified products list which may be obtained from the Transportation Laboratory.

The inside surfaces of bolt holes shall be painted with one application of a zinc rich primer (organic vehicle type) after the application of the undercoat of inorganic zinc on adjacent steel. The steel surfaces adjacent to the bolt holes shall be kept clean and protected from drippings during the application of the primer.

The color of the final application of inorganic zinc coating shall match Federal Standard 595B No. 36373.

Inorganic zinc coating shall be used within 12 hours of initial mixing.

Application of inorganic zinc coating shall conform to the provisions for applying zinc-rich coating in Section 59-2.13, "Application of Zinc-Rich Primer," of the Standard Specifications.

Inorganic zinc coating shall not be applied when the atmospheric or surface temperature is less than 7°C nor more than 29°C, nor when the relative humidity exceeds 85 percent.

The single undercoat of inorganic zinc coating shall be applied to the required dry film thickness in 2 or more applications within 4 hours after blast cleaning.

The total dry film thickness of all applications of the inorganic zinc undercoat, including the surfaces of outside existing members within the grip under bolt heads, nuts and washers, shall be not less than 100 µm nor more than 200 µm, except that the total dry film thickness on each faying (contact) surface of high strength bolted connections shall be between 25 µm and the maximum allowable dry film thickness for Class B coatings as determined by certified testing in conformance with Appendix A of the "Specification for Structural Joints Using ASTM A325 or A490 Bolts" of the Research Council on Structural Connections (RCSC Specification). Unless otherwise stated, all inorganic zinc coatings used on faying surfaces shall meet the slip coefficient requirements for a Class B coating on blast-cleaned steel, as specified in the RCSC Specification. The Contractor shall provide results of certified testing showing the maximum allowable dry film thickness for the Class B coating from the qualifying tests for the coating he has chosen, and shall maintain the coating thickness on actual faying surfaces of the structure at or below this maximum allowable coating thickness.

Areas where mudcracking occurs in the inorganic zinc coating shall be blast cleaned and repainted with inorganic zinc coating to the specified thickness.

Dry spray, or overspray, as defined in the Steel Structures Painting Manual, Volume 1, "Good Painting Practice," of the "SSPC: The Society for Protective Coatings," shall be removed prior to application of subsequent coats or final acceptance. Removal of dry spray shall be by screening or other methods that minimize polishing of the inorganic zinc surface. The dry film thickness of the coating after removal of dry spray shall be in conformance with the provisions for applying the single undercoat, as specified herein.

The inorganic zinc coating shall be tested for adhesion and cure. The locations of the tests will be determined by the Engineer. The sequence of the testing operations shall be determined by the Contractor. The testing for adhesion and cure will be performed no sooner than 72 hours after application of the single undercoat of inorganic zinc coating. At the Contractor's expense, satisfactory access shall be provided to allow the Engineer to determine the location of the tests and to test the inorganic zinc coating cure. The inorganic zinc coating shall pass the following tests:

Adhesion

- The inorganic zinc coating shall have a minimum adhesion to steel of 4 MPa when measured at no more than 6 locations per span on each girder using a self-aligning adhesion tester in conformance with the requirements in ASTM Designation: D 4541. The Contractor, at the Contractor's expense, shall: (1) verify compliance with the adhesion requirements, (2) furnish test results to the Engineer, and (3) repair the coating after testing.

Cure

- The inorganic zinc coating, when properly cured, shall exhibit a solid, hard, and polished metal surface when firmly scraped with the knurled edge of a quarter. Inorganic zinc coating that is powdery, soft, or does not exhibit a polished metal surface, as determined by the Engineer, shall be repaired by the Contractor, at the Contractor's expense, by blast cleaning and repainting with inorganic zinc coating to the specified thickness.

The final coat of inorganic zinc coating shall be applied after testing for adhesion, testing for cure, and completion of all operations that may damage or discolor the steel surface, including correction of runs, sags, thin and excessively thick areas in the paint film, skips and holidays, dry spray, or areas of non-uniform appearance.

The area to receive the final coat of inorganic zinc coating shall be lightly roughened by abrasive blasting using an abrasive no larger than 600 µm. Abrasive blasting shall remove no more than 15 µm of inorganic zinc. The surface to be lightly roughened shall be free from moisture, dust, grease or deleterious material. The undercoated areas of the under surfaces of bottom flanges shall be protected from abrasive blast cleaning operations.

The final coat of inorganic zinc coating shall be applied to the required dry film thickness in one uniform application within 24 hours after light roughening. The dry film thickness of the final coat shall be not less than 25 µm nor more than 75 µm.

Except at bolted connections, the total dry film thickness of all applications of the single undercoat and final coat of inorganic zinc coating shall be not less than 125 µm nor more than 275 µm.

Finish coats will not be required.

PAINTING STEEL RINGS

All surfaces of the steel ring forms and attached ring plates and headed studs shall receive a 2-coat liquid epoxy system consisting of 2-component high-build polyamide epoxy (with 70 percent solids content) applied for a total thickness of 400 µm. Coating shall be shop applied and cured in conformance with manufacturer's written specifications.

Surfaces to be coated shall first be dry blast cleaned in conformance with the requirements in Surface Preparation No. 5, "White Metal Blast Cleaning," of the Steel Structures Painting Council. Surface profile shall be in accordance with coating manufacturer's recommendations. Prior to blast cleaning, remove oil, grease, welding fluxes, and other surface contaminants. Following blast cleaning, clean surfaces of dust and residual particles from cleaning operations by dry (no oil or water vapor) air blast cleaning or other method prior to applying coating. Vacuum clean enclosed areas and other areas where dust settling is a problem and wipe with a tack cloth. Coat surfaces the same day they are blasted. Reblast surfaces that have started to rust before they are coated.

Provide a magnetic type dry film thickness gauge to test coating thickness specified in µm or equivalent mils. Provide an electrical holiday detector, low voltage, wet sponge type to test finish coat for holidays and discontinuities. Test one hundred percent of surface and repair all defects found in accordance with recommendations of coating manufacturer.

PAYMENT

Full compensation for preparing and painting steel footing rings with epoxy shall be considered as included in the contract lump sum price paid for clean and paint structural steel and no additional compensation will be allowed therefor.

10-1.64 ALTERNATIVE PIPE

Alternative pipe culverts shall conform to the provisions in Section 62, "Alternative Culverts," of the Standard Specifications and these special provisions.

Concrete backfill for alternative culverts shall be constructed in conformance with the provisions in Section 66-1.045, "Concrete Backfill," of the Standard Specifications and will be measured and paid for in conformance with the provisions in Section 66-4, "Measurement and Payment," of the Standard Specifications and the following:

- A. The quantity of concrete backfill to be paid for, regardless of the kind of culvert and wall thickness of the culvert installed, will be based on the dimensions shown on the plans and the installation of corrugated steel pipe, except that when reinforced concrete pipe is designated as the only kind of culvert allowed for the installation of an alternative culvert, the quantity of concrete backfill to be paid for at that installation, regardless of the kind of culvert and wall thickness of the culvert installed, will be based on the dimensions shown on the plans and the installation of reinforced concrete pipe with the least wall thickness shown in AASHTO Designation: M 170M for the Class of pipe designated.

10-1.65 PLASTIC PIPE

Plastic pipe shall conform to the provisions in Section 64, "Plastic Pipe," of the Standard Specifications and these special provisions.

10-1.66 900 mm REINFORCED CONCRETE PIPE

Reinforced concrete pipe shall conform to the provisions in Section 65, "Reinforced Concrete Pipe," of the Standard Specifications and these special provisions.

Where embankment will not be placed over the top of the pipe, a relative compaction of not less than 85 percent shall be required below the pipe spring line for pipe installed using Method 1 backfill in trench, as shown on Standard Plan A62D.

Where the pipe is to be placed under the traveled way, a relative compaction of not less than 90 percent shall be required unless the minimum distance between the top of the pipe and the pavement surface is the greater of 1.2 m or one half of the outside diameter of the pipe.

Except as otherwise designated by classification on the plans or in the specifications, joints for culvert and drainage pipes shall conform to the plans or specifications for standard joints.

When reinforced concrete pipe is installed in conformance with the details shown on Standard Plan A62DA, the fifth paragraph of Section 19-3.04, "Water Control and Foundation Treatment," of the Standard Specifications shall not apply.

When solid rock or other unyielding material is encountered at the planned elevation of the bottom of the bedding, the material below the bottom of the bedding shall be removed to a depth of 1/50 of the height of the embankment over the top of the culvert, but not less than 150 mm nor more than 300 mm. The resulting trench below the bottom of the bedding shall be backfilled with structure backfill material in conformance with the provisions in Section 19-3.06, "Structure Backfill," of the Standard Specifications.

10-1.67 CORRUGATED STEEL PIPE

Corrugated steel pipe for isolation casings shall conform to the provisions in Section 66, "Corrugated Metal Pipe," of the Standard Specifications and these special provisions.

Corrugated steel pipe shall be fabricated from zinc-coated steel sheet.

Attention is directed to "Miscellaneous Metal(Bridge)" of these special provisions for isolation casings covers.

Concrete for filling the area between the top of the CIDH and the corrugated steel pipe shall be minor concrete in accordance with Section 90-10, "Minor Concrete" of the Standard Specifications.

Full compensation for furnishing and placing minor concrete at the bottom of isolation casings, as shown on the plans, shall be considered as included in the contract price paid per per meter for 3660 mm corrugated steel pipe and no separate payment will be made therefor.

10-1.68 EDGE DRAIN

Edge drains shall conform to the provisions in Section 68-3, "Edge Drains," of the Standard Specifications and these special provisions.

Outlet and vent covers will not be required.

10-1.69 MISCELLANEOUS FACILITIES

Alternative Flared End Section shall conform to the provisions in Section 70, "Miscellaneous Facilities," of the Standard Specifications and these special provisions.

10-1.70 SLOPE PROTECTION

Slope protection shall be placed or constructed in conformance with the provisions in Section 72, "Slope Protection," of the Standard Specifications and these special provisions.

Rock slope protection fabric shall be woven or nonwoven type fabric, Type B.

10-1.71 SLOPE PAVING

Slopes under the ends of bridges, where shown on the plans, shall be paved in conformance with the provisions in Section 72-6, "Slope Paving," of the Standard Specifications and these special provisions.

The slope paving shall be colored in conformance with the provisions in Section 72-6.03, "Materials," of the Standard Specifications.

Concrete for curbs will be paid for at the contract price per cubic meter for minor concrete .

10-1.72 MISCELLANEOUS CONCRETE CONSTRUCTION

Minor Concrete (Curb and Miscellaneous Construction) shall conform to the provisions in Section 73, "Concrete Curbs and Sidewalks," of the Standard Specifications and these special provisions.

Curb ramp detectable warning surface shall conform to the details shown on the plans and shall not be constructed or installed on curb ramps with a slope that exceeds 6.67 percent. The finished surfaces of the detectable warning surface shall be free from blemishes.

Curb ramp detectable warning surface shall consist of raised truncated domes constructed or installed on curb ramps. Detectable warning surface, at the option of the Contractor, shall be either cast-in-place or stamped into the surface of the curb ramp, or shall be a prefabricated surface installed on the curb ramp. The color of the detectable warning surface shall be yellow conforming to Federal Standard No. 595B, Color No. 33538. Detectable warning surface, either cast-in-place or stamped into the surface of the curb ramp, shall be painted yellow in conformance with the provisions in Section 59-6, "Painting Concrete," of the Standard Specifications.

Prior to constructing curb ramps with a cast-in-place or stamped detectable warning surface, a test panel shall be constructed on the project site and shall be of a size not less than 600 mm by 600 mm. The test panel shall be constructed, finished and cured with the same materials, tools, equipment, and methods to be used in constructing the proposed permanent work. Additional test panels shall be constructed as necessary until a panel is produced which demonstrates, to the satisfaction of the Engineer, the ability of the selected procedure to produce a detectable warning surface that meets all of the specified requirements.

Full compensation for constructing or installing a curb ramp detectable warning surface shall be considered as included in the contract price paid per cubic meter for minor concrete (curb ramp) and no separate payment will be made therefor.

10-1.73 MISCELLANEOUS IRON AND STEEL

Miscellaneous iron and steel shall conform to the provisions in Section 75, "Miscellaneous Metal," of the Standard Specifications and these special provisions.

10-1.74 MISCELLANEOUS METAL (BRIDGE)

Miscellaneous metal (bridge) shall conform to the provisions for miscellaneous bridge metal in Section 75, "Miscellaneous Metal," of the Standard Specifications and these special provisions.

Attention is directed to "Welding Quality Control" of these special provisions.

Miscellaneous metal (bridge) shall consist of the miscellaneous bridge metal items listed in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications, and the following:

- A. Abutment and hinge bearing plates
- B. Navigation lighting swivel mounts, soffit navigation light and radar beacon covers
- C. Isolation casing covers, guardrail posts, hardware and support beams
- D. Metal railings (except Tubular Handrailing (Modified))
- E. Ferrule loop anchors and inserts for future maintenance travelers
- F. Ladders at fenders, steel tube grating supports at fenders

Self-tapping screws shall be hex-head, stainless steel or monel metal, installed in holes drilled to fit the self-tapping screws.

For drainage piping NPS 8 or smaller, which is: (1) enclosed in a box girder cell and exposed for a length not greater than 6 m, or (2) encased in concrete, the Contractor shall have the option of substituting polyvinyl chloride (PVC) plastic pipe, with the same diameter and minimum bend radius as shown on the plans, for welded steel pipe. The support spacing for PVC plastic pipe shall be 2.5 m, maximum. The PVC plastic pipe shall be Schedule 40 conforming to the requirements of ASTM Designation: D 1785. If PVC plastic pipe is substituted for welded steel pipe, the quantity of drainage piping will be computed on the basis of the dimensions and details shown on the plans and no change in the quantities to be paid for will be made because of the use of PVC plastic pipe.

Cast-in-place inserts shall be the ferrule loop type.

All metal parts of anchorage devices shall be fabricated from stainless steel conforming to the requirements of ASTM Designation: A 276, Type 316.

The navigation lighting swivel mounts shall be designed by the Contractor and shall conform to the details shown on the plans. Suitable materials, as approved by the Engineer, shall be used so that maintenance of the swivel mount is minimized. The device shall be designed so that a person of average strength can operate it without any difficulty.

The steel cover plate, support angle and anchorage devices for Pier 5 shall conform to the provisions in Section 75, "Miscellaneous Metal," of the Standard Specifications and these special provisions. Steel pipe posts for the Pier 5 isolation wall cover guard rail shall be ASTM A500, Grade B or ASTM A501. The cover plate, guardrail, hardware and support angle shall not be galvanized. The cover plate and support angle shall be painted in accordance with "Clean and Paint Structural Steel" of these special provisions.

Isolation casing covers need not be galvanized but shall be painted in accordance with "Clean and Paint Structural Steel" of these special provisions.

Pourable seals at isolation casing covers shall be Type A and shall conform to the requirements of Section 51-1.12, "Sealed Joints," of the Standard Specifications.

The fender ladders shall be coated with two coats of a 100% solids epoxy mixed with aggregate for slip resistance. The minimum dry film thickness shall be 12 mils. The epoxy shall be formulated to resist deterioration due to ultra violet light. The galvanized ladders shall be solvent cleaned before being coated with epoxy.

Full compensation for painting isolation casing covers, and for pourable seals as shown on the plans, shall be considered as included in the contract price paid per kilogram for miscellaneous metal (bridge) and no separate payment will be made therefor.

10-1.75 MISCELLANEOUS METAL (MAINTENANCE ACCESS)

Miscellaneous metal (maintenance access) shall conform to the provisions for miscellaneous bridge metal in Section 75, "Miscellaneous Metal," of the Standard Specifications, the details shown on the plans and these special provisions.

Miscellaneous metal (maintenance access) shall consist of the following:

- I. Stairs and Landings within the piers
- II. Fixed platforms within the superstructure
- III. Bridges and gratings across hinges, and cable railings at hinges

The stair system and miscellaneous platforms within the box section or the piers shall be designed by the Contractor and shall meet the following minimum requirements:

- 1.) Stair systems shall be assembled by field bolted connections as shown on the plans. Field welded connections will not be allowed, except for railing connections.
- 2.) Stringers shall be channel sections, minimum C200x173.) All bolts shall be ASTM A 325 high strength bolts.
- 4.) Stair treads shall be of steel grating construction with cast abrasive nosings.
- 5.) Landings shall be minimum 50 mm thick grating on a steel support structure, grating shall be welded to the support system prior to galvanizing.
- 6.) All imbeds used in pier walls to support the stair system shall be galvanized (rethreading after galvanizing is required).
- 7.) Maximum riser shall be 200 mm.
- 8.) Minimum tread run shall be 280 mm.
- 9.) An outer railing system shall be provided as shown on the plans. The railing height shall be 1000 mm on the stairs and on landings.
- 10.) All components of the stair and rail system shall be hot dip galvanized after fabrication.
- 11.) A platform shall be provided at the top of the pier stairs as shown on the plans. A rung ladder shall extend from the platform through the opening in the bridge soffit. It shall have movable extensions extending 1 meter above the slab level. The platform shall have railing on both sides.
- 12.) The landings and platforms shall be designed for 4.78 kPa uniform live loading and individual stair treads shall be designed to support a 1.33 kN concentrated load placed in a position which causes the maximum stress. Stair stringers shall be designed for a uniform live load equal to 4.78 kPa on each tread.

The Contractor shall submit working drawings and calculations for all miscellaneous metal (maintenance access) to the Resident Engineer's Office 757 Arnold Drive, Suite 200 Martinez, California 94553 at telephone number (925) 646-1996 for approval in accordance with the provisions in Section 5-1.02, "Plans and Working Drawings". Calculations and working drawings shall be stamped and signed by an engineer who is registered as a Civil Engineer in the State of California. The Contractor shall allow the Engineer 4 weeks to review the drawings and calculations after a complete set has been received. For initial review, 10 sets shall be submitted. After review, between 6 and 12 sets, as requested by the Engineer, shall be submitted to said Office for final approval and for use during construction.

At the installation of all miscellaneous metal (maintenance access), one set of reduced prints on 75-g/m² (minimum) bond paper, 279 mm x 432 mm in size, of the corrected original tracings of all working drawings for all miscellaneous metal (maintenance access) shall be furnished to the Engineer. An index prepared specifically for the drawings containing sheet numbers and titles shall be included on the first reduced print in the set.

The edge of the corrected original tracing image shall be clearly visible and visually parallel with the edges of the page. A clear, legible symbol shall be provided on the upper left side of each page to show the amount of reduction and a horizontal and vertical scale shall be provided on each reduced print to facilitate enlargement to original scale.

The Contractor shall also submit suitable documents to the State verifying conformance to all material specifications for the all miscellaneous metal (maintenance access). Contractor shall not order or fabricate any materials before obtaining the State's approval of such submittals.

Payment

The contract lump sum price paid for miscellaneous metal (maintenance access) shall include full compensation for furnishing all labor, materials, equipment, and incidentals and for doing all the work involved in furnishing and installing all miscellaneous metal (maintenance access), complete in place, including design and submitting calculations, shop drawings and concrete inserts, as specified in these special provisions and as directed by the Engineer.

10-1.76 MISCELLANEOUS METAL (MOVABLE INSPECTION PLATFORMS)

Movable inspection platforms shall consist of designing, detailing, fabricating, testing and installing a system of movable inspection platforms, including support rails, trolley system, manual motive power system, platform structures, ladders, handrails at piers all in accordance the details shown on the plans, the Standard Specifications and these special provisions.

Materials—

Unless otherwise noted, materials shall conform to the current ASTM specifications as outlined below:

Material	Description	Designation
Steel castings	High strength, structural purposes	A148
	Carbon steel, general application	A27
Iron castings	Gray iron	A48
Bronze castings	Bronze castings for bridges	B22
		(Max. sulfur content 0.08%, chemical analysis required for each heat)
Sintered bronze	Copper base metal powder sintered bearings	B438
Bronze rods	Phosphor bronze rods, bars and shafts	B139
Steel Forgings	Carbon and alloy steel for industrial use	A668
Shapes, plates, and bars	Structural steel	A709 Grade 50W
Structural bolts, nuts and washers	High strength bolts for structural steel joints	A325

Movable inspection platforms, rails and all ferrous material associated with the movable inspection platforms shall be painted in accordance with "Clean and Paint Structural Steel," of these special provisions. As an alternative to painting of the trolley system, non-machined ferrous metal work may be hot-dip galvanized in accordance with "Miscellaneous Metal," of these special provisions.

All bolts, nuts, studs, washers, pins, terminals, springs, hangers, cap screws, tap bolts, brackets, and other hardware fastenings and fittings other than high strength bolts shall be of an approved corrosion-resistant material such as silicon bronze or stainless steel. Hot-dip galvanizing in accordance with "Miscellaneous Metal," of these special provisions will be considered acceptable treatment for all non-moving ferrous hardware.

Construction methods--

Geometric and Operational Requirements: The inspection system shall provide access to the underside of the inside of the superstructure as shown in the plans. Telescoping side arms shall be used to allow the platform to pass pilasters on the sides of the concrete box. Each platform shall have a retractable ladder near the middle of the platform which provides access from the bottom slab of the concrete box when the platform is not near a pier.

The emergency brake system shall be designed to be in the fully applied position when the foot pedal is not depressed. Release of the foot pedal shall bring the platform to a gradual stop using a hydraulic dashpot which slowly engages the emergency brake.

Platform Speed: The platform manual drive system shall be designed for a velocity of 4.57 m/min and shall be geared to allow for operation by one person using one hand at 30-40 rev/min. The maximum force on the crank handle required to start the platform up a 3.42% grade shall be 15 lb. An inertial type flywheel and gearing system is preferred.

The operating mechanism of each inspection platform must be secured by an appropriate locking device.

Grade: The platforms shall be designed to operate within the above criteria for the grades within the longitudinal length served by the platform. Uniformity between platforms in different spans shall be required to simplify future maintenance and exchange of parts.

Design: Design and manufacture of the trolley system for the inspection platforms shall be performed by a Contractor demonstrating a minimum of 5 years of experience in the design and manufacture of movable suspended platforms. Experience shall be submitted with the first working drawing submittal.

Reference Standards: All or portions of certain recognized industry or association standards referred to herein as being a requirement of this Specification shall be considered as binding as though reproduced in full herein unless supplemented and/or modified by more stringent requirements of the Contract Documents. Unless otherwise stated, the reference standard

shall be the standard which is current as of the date of issuance of this Specification. Reference may be made to standards either by full name or, for the sake of brevity, by letter designation as follows:

AASHTO:	American Association of State Highway and Transportation Officials
AGMA:	American Gear Manufacturers Association
ANSI:	American National Standards Institute
ASTM:	American Society for Testing and Materials
AWS:	American Welding Society
JIC:	Joint Industrial Council
MMA:	Monorail Manufacturers Association
OSHA:	Occupational Safety and Health Administration
SAE:	Society of Automotive Engineers

Design, manufacture, and operation of the system shall be in accordance with the applicable sections of the following design codes or guidelines:

OSHA :	(1910.67, 1910.68, 1926.556)
AASHTO :	(Including "Standard Specifications for Movable Highway Bridges")
MMA	
JIC	
ANSI :	(A92.5)

Design Loads--the movable platform shall be designed for the following design loads:

Live Load (including impact): LL + I:
2.87 kPa distributed load on platform surface
455 kg concentrated load anywhere on platform
Load Combinations:

C. 1.2 (DL) + LL + I@100% of allowable stress

Drawings-- The Contractor shall submit working drawings and calculations for the movable inspection platforms to the Resident Engineer's Office 757 Arnold Drive, Suite 200 Martinez, California 94553 at telephone number (925) 646-1996, for approval in accordance with the provisions in Section 5-1.02, "Plans and Working Drawings". For initial review, 10 sets shall be submitted. After review, between 6 and 12 sets, as requested by the Engineer, shall be submitted to said Office for final approval and for use during construction.

The drawings shall include the rails and rail brackets and their connections to the superstructure; trolleys; manual drive and emergency brake system; catalog cuts of the drive mechanism and the trolley system and the platform itself. The information provided in the contract plans and this Specification defines the performance requirements of the system and is intended as a guideline for the detailed design of the system. Contract plan details which are used "as shown" shall not be exempt from the requirements for detailing and design by the Contractor.

The drawings shall detail and accurately dimension all parts. Limits of accuracy, tolerances required for machining, surface finishes and allowances for fit will be given so that prescribed limits are not exceeded.

At the installation of the movable inspection platforms, one set of reduced prints on 75-g/m² (minimum) bond paper, 279 mm x 432 mm in size, of the corrected original tracings of all working drawings for the movable inspection platforms shall be furnished to the Engineer. An index prepared specifically for the drawings containing sheet numbers and titles shall be included on the first reduced print in the set.

The edge of the corrected original tracing image shall be clearly visible and visually parallel with the edges of the page. A clear, legible symbol shall be provided on the upper left side of each page to show the amount of reduction and a horizontal and vertical scale shall be provided on each reduced print to facilitate enlargement to original scale.

Products

Compatibility: Products provided shall be compatible with other parts of the work including resistance to electrolysis or galvanic action.

Nameplates: Each piece of mechanical equipment and apparatus shall have a permanent, corrosion-resistant metal nameplate on which is stamped the name of the manufacturer, the catalog or model number, the serial number and the rating or capacity of the equipment or apparatus.

Full scale test

The first system to be fabricated shall be erected in the shop to represent true field conditions. The rails shall be sloped to match the steepest and the flattest slopes each platform will encounter when installed in the bridge. All the equipment and machinery of the system shall then be fully tested in accordance with this specification in the presence of the Engineer. Any modifications required for proper performance of the platform system shall be made in the shop and when operating as specified and to the satisfaction of the Engineer shall be incorporated in the production platform systems.

Fabrication of remaining platforms shall not begin until the test platform system is satisfactorily tested and approved by the Engineer.

Erection

Erection and assembly of the machinery shall be in accordance with part number and match marks. All parts shall be adjusted for precise alignment by means of shims and pulled tightly against supporting members by the use of clamps, temporary bolts, or other approved means before drilling and reaming holes for connecting bolts. All machinery shall be so installed as to insure satisfactory operation. Erection and adjustment of machinery shall be by millwrights with demonstrated skill in this type of work. Bolt holes in structural steel supports shall be drilled from the solid material after alignment of machinery.

Mounting surfaces shall be free of dirt, paint and other foreign materials. Connecting bolts and nuts shall be securely tightened to torque values appropriate for the bolt and nut sizes.

Testing on the installed systems shall be conducted to demonstrate their satisfactory performance. The results of the tests shall be fully documented. The tests to be conducted shall be, but are not necessarily limited to, the following:

Test 1 : Demonstrate platform movements as required in the plans for inspection of the entire underside of the inside of the box girder. Test documentation shall include the force required to start the platform up the steepest grade in each installation and to maintain platform design velocity.

Test 2 : Demonstrate satisfactory operation of system emergency brakes to produce an acceptable deceleration rate; demonstrate satisfactory operation of safety devices.

Training

The Contractor shall provide a minimum of 8 hours of classroom instruction for the State's maintenance employees (up to a maximum of 10 people).

Each attendee shall be provided a notebook including a course outline and manuals and/or textbooks pertaining to the subject matter covered in the course.

The course shall include the following topics:

1. Preventative Maintenance Procedures.
2. Trouble shooting and minor repairs.
3. Operation of the Inspection Platform System.

The Contractor shall provide a minimum of 8 hours of on-site instruction related to the topics covered in the classroom.

Trolley System

Each platform assembly shall be supported under box girder ribs and manually driven by an underhung trolley system. The inspection platform system shall consist of fourteen platform sub-systems located on the bridge as shown in the plans. Each sub-system shall consist of two parallel tracks per platform running the length of the span between piers or hinges including applicable accessories. Design and manufacture of the trolley system shall be in accordance with the Monorail Manufacturers Associations (MMA) "Specifications for Underhung Cranes and Monorail Systems" as modified for manual operation. The service classification for this unit is Class "C", Moderate Service.

Track: The track system, including rails and connections shall be a product manufactured specifically for underhung cranes. The rails shall be continuous welded rail.

Lubrication

Three permanent lubrication charts shall be furnished by the Contractor. The charts shall identify all points at which lubrication fittings are located and will designate the kind of lubricant and frequency of lubrication required at each point. The charts shall be a part of the instruction booklet referenced in this special provision.

The lubrication charts will be submitted, as shop drawings, for approval.

The fittings in bearings shall be so located or attached with seamless brass or stainless steel tubing so that the grease is introduced directly into the grease grooves for distribution. Tubing is to be extended from the bearings at convenient lubrication stations.

In such cases the pipes must be securely supported and so located as to protect them from damage and prevent vibration during application of live load.

Brass pipe for lubrication systems shall meet the requirement of ASTM B43 and bronze fittings the requirements of ASTM B62. The Contractor shall supply one grease gun for each type fitting.

Lubricants: Immediately after erection and before operation, all rotating and sliding parts shall be lubricated and all gear housings filled with the lubricants called for on the lubrication charts.

Steel work shall be sub-drilled at assembly or erection from the solid components after proper alignment and line reamed to suit the turned bolts.

Shims: Shims required for leveling and alignment shall be steel, full depth shims, drilled for all bolts that pass through them and trimmed to the dimensions of the assembled unit. Thin brass or stainless steel shims of precise thickness shall be provided to permit 0.5 mm variations of the shim allowance plus one full allowance shim. All shims less than 6 mm thick shall be corrosion-resistant.

Fittings: Button head fittings shall be provided on all bearings and other machinery (not including gear teeth) requiring grease lubrication.

Instruction Booklets

The Contractor shall provide, integrate, and assemble information required for instruction booklets and furnish six bound copies each of two loose-leaf booklets to the Resident Engineer. The arrangement of the booklets, the method of binding, materials to be included, and the composite text shall all be reviewed and approved by the Engineer.

First Booklet:

The first booklet shall contain the following:

- A. Table of Contents
- B. Operator's Instructions, which shall cover in full the step-by-step sequence of operation of the inspection device and its auxiliaries, and shall note all precautions required for correct operation.
- C. Detailed maintenance instructions for adjusting, calibrating and operating all of the equipment, including manufacturer's recommended preventative maintenance lubrication schedule.
- D. A set of descriptive leaflets, bulletins, and drawings covering all items of equipment and apparatus made a part of the completed unit.

The catalog number and serial number of each piece and, where applicable, a complete parts list. This information will be used if it becomes necessary to order replacement parts from the manufacturer. This information shall be furnished for all equipment such as gear box, brakes, etc.

- D. Copies of all warranties on equipment supplied to the project.

Second Booklet:

The second booklet shall contain legible, reduced, photostatic, black-line copies of the following drawings, corrected to show the work as constructed:

- A. The complete spare parts list.
- B. Detail drawings and shop drawings of the platforms.

The materials for the instruction booklets shall be bound into each booklet between rigid plastic binding covers. The instruction booklet shall be approximately 225 mm by 300 mm, and the diagram booklet large enough to contain the drawings without excessive folding so that they may be easily opened. Covers shall allow for insertion of additional information.

The booklets shall be neatly entitled with a descriptive title, the name of the project, the location, year of installation, Owner, Contractor and Engineer.

PAYMENT

The contract lump sum price paid for miscellaneous metal (movable inspection platforms) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the movable inspection platforms, complete in place, including detailing, fabricating, testing and installing a movable inspection platforms, platform assembly, machinery, instruction booklets, training, and cleaning and painting of the movable platform system, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

If a portion or all of the movable inspection platforms are tested at a site more than 480 air line kilometers from both Sacramento and Los Angeles, additional shop inspection expenses will be sustained by the State. Payment to the Contractor miscellaneous metal(movable inspection platforms) will be reduced \$5,000 for each testing site located more than 480 air line kilometers from both Sacramento and Los Angeles.

10-1.77 BRIDGE DECK DRAINAGE SYSTEM.

Bridge deck drainage system shall conform to the requirements of Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications and Section "Miscellaneous Metal" of these special provisions.

Prior to acceptance of the bridge deck drainage system, each deck drain will be flushed out and tested to insure that it is flowing at full capacity. Any obstructions which prevent the free flow of drainage shall be removed.

MEASUREMENT AND PAYMENT

Bridge Deck Drainage System will be measured and paid for by the kilogram.

The contract unit price paid per kilogram for bridge deck drainage system shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in installing the bridge deck drainage system, complete in place, including pipe hangers, miscellaneous inserts and pipe sleeves, as shown on the plans, as specified in the Standard Specifications and these special provisions and as directed by the Engineer.

10-1.78 FIBERGLASS GRATING

Fiberglass grating shall conform to the details shown on the plans and these special provisions.

The Contractor shall submit working drawings for fiberglass grating to the Resident Engineer's Office, for approval in accordance with the provisions in Section 5-1.02, "Plans and Working Drawings". For initial review, 10 sets shall be submitted. After review, between 6 and 12 sets, as requested by the Engineer, shall be submitted to said Office for final approval and for use during construction.

At the installation of fiberglass grating, one set of reduced prints on 75-g/m² (minimum) bond paper, 279 mm x 432 mm in size, of the corrected original tracings of all working drawings for the fiberglass grating shall be furnished to the Engineer. An index prepared specifically for the drawings containing sheet numbers and titles shall be included on the first reduced print in the set.

The edge of the corrected original tracing image shall be clearly visible and visually parallel with the edges of the page. A clear, legible symbol shall be provided on the upper left side of each page to show the amount of reduction and a horizontal and vertical scale shall be provided on each reduced print to facilitate enlargement to original scale.

The Contractor may substitute fiberglass support beams for the galvanized steel tubes shown on the plans. Fiberglass support beams shall be designed and sized for the grating loads specified herein.

Working drawings shall include the following:

1. Product Data: Catalog information and catalog cuts showing materials, design tasks, and showing load, span, and deflection; include manufacturer's specifications.
2. Grating: Show dimensions, weight, size, and location of connections to adjacent grating, supports, and other work.
3. Grating Supports: Show dimensions, weight, size, span direction, location, and anchorage to supporting structure.

The Contractor shall also submit suitable documents to the State verifying conformance to all material specifications for the fiberglass grating. Submittals shall include: working drawings for all fiberglass reinforced plastic products and fabrications, certified test reports, and such material samples, manufacturers literature, and other items that the State may require for verification of material conformance. Contractor shall not order or fabricate any materials before obtaining the State's approval of such submittals.

Fiberglass grating shall be prepared for shipment as follows:

1. Insofar as is practical, items shall be factory assembled.

4. Parts and assemblies that are of necessity shipped unassembled shall be packaged and clearly in a manner that will protect the materials from damage, and facilitate identification and final assembly in the field.

MATERIALS—

Materials for constructing the fiberglass grating shall conform to the following requirements:

General:

Galvanized steel grating support members shall conform to the requirements in Section 75-1.03, "Miscellaneous Bridge metal" of the Standard Specifications. Bolts and or threaded inserts to attach steel grating support beams shall be ASTM A276, Type 316 stainless steel.

Fiberglass grating shall conform to the following:

1. Like Items of Materials: Where possible, provide end products of one manufacturer in order to achieve standardization for appearance, maintenance, and replacement.
2. All products shall be manufactured by a pultruded process using vinyl ester resin.
3. Products shall be manufactured with ultra-violet (UV) inhibitor additives.
4. Exterior surfaces shall have a synthetic surface veil covering.
5. Fire Retardance:
 - a. Flame spread shall be less than 25 as measured by ASTM E84.
 - b. Meet self-extinguishing requirements of ASTM D635.
6. Color pigment shall be dispersed in the resin system. The color of the grating shall be concrete gray to approximately match the surrounding concrete.
7. Fabricate FRP products exposed to outdoor conditions with an additional 1-mil-thick UV coating to shield product from UV light.
8. All cut ends, holes, and abrasions of FRP shapes shall be sealed with resin to prevent intrusion of moisture.

Grating:

1. Design of gratings shall conform to the following:
 - a. 689 kPa minimum load, unless otherwise shown.
 - b. Maximum Deflection: 6 mm, unless otherwise shown.
2. Gratings shall be pultruded type conforming to the following:
 - a. Main bars joined by cross bars secured in holes drilled in main bars.
 - b. Cross bars, with 150 mm maximum spacing, shall mechanically lock main bars in position such that they prevent movement.
 - c. Intersections: Bond using adhesive as corrosive-resistant as pultrusion resin.
 - d. Main Bar Ends: Minimum bearing support width of 40 mm.
 - e. Skid-Resistant Surface: Grit adhesively bonded, manufacturer's standard.
 - f. Provide extra stiffness around openings.
3. Hold-Down Clamps shall be ASTM A276, Type 316 stainless steel.
4. Bolts and Connectors shall conform to the following:
 - a. Corrosion-resistant FRP or ASTM A276, Type 316 stainless steel.Size and strength to meet UBC requirements.

INSTALLATION

Fiberglass grating shall be installed in accordance with the manufacturer's written instructions and shall be installed plumb or level, rigid and neat, as applicable. All field cut holes, edges, and abrasions shall be sealed with a catalyzed resin compatible with original resin. Grating shall be securely anchored to supports to prevent displacement and each grating section shall be easily removable. Grating clearance to vertical surfaces shall be 8 mm (plus or minus 4 mm).

PAYMENT

The contract square meter price paid for fiberglass grating shall include full compensation for furnishing all labor, materials, equipment, and incidentals and for doing all the work involved in furnishing and installing fiberglass grating,

complete in place, including furnishing all required working drawings and manufacturer's information, as specified in these special provisions and as directed by the Engineer.

Full compensation for galvanized steel support beams and anchorages, shall be considered as included in the contract price paid for fiberglass grating and no additional compensation will be allowed therefor.

10-1.79 FIBERGLASS REINFORCED PLASTIC DOORS AND FRAMES

Fiberglass reinforced plastic doors and frames shall conform to the details shown on the plans and these special provisions.

GENERAL

This work shall consist of furnishing and installing corrosion resistant fiberglass hinged doors and frames and associated hardware in accordance with the details shown on the plans and these special provisions.

SUBMITTALS

The Contractor shall submit working drawings for fiberglass reinforced plastic doors and frames to the Resident Engineer's Office 757 Arnold Drive, Suite 200 Martinez, California 94553 at telephone number (925) 646-1996, for approval in accordance with the provisions in Section 5-1.02, "Plans and Working Drawings". For initial review, 10 sets shall be submitted. After review, between 6 and 12 sets, as requested by the Engineer, shall be submitted to said Office for final approval and for use during construction.

At the installation of fiberglass reinforced plastic doors and frames, one set of reduced prints on 75-g/m² (minimum) bond paper, 279 mm x 432 mm in size, of the corrected original tracings of all working drawings for the fiberglass reinforced plastic doors and frames shall be furnished to the Engineer. An index prepared specifically for the drawings containing sheet numbers and titles shall be included on the first reduced print in the set.

The edge of the corrected original tracing image shall be clearly visible and visually parallel with the edges of the page. A clear, legible symbol shall be provided on the upper left side of each page to show the amount of reduction and a horizontal and vertical scale shall be provided on each reduced print to facilitate enlargement to original scale.

Working drawings shall include the following:

1. Manufacturer's literature, and drawings prepared for this project showing types, locations, sizes, complete details of construction, and anchorage for frames.
2. Manufacturer's installation instructions; manufacturer's instructions for handling and care of products.
 5. Manufacturer's technical information and catalog cuts for each item of door hardware and a door hardware schedule shall be submitted for approval prior to installation.
 6. Manufacturer's catalog cuts shall include catalog numbers, material, grade, type, size, function, design, quality and finish of hardware.
7. Color sample proposed for door and frame.

PRODUCTS

Fiberglass Reinforced Plastic Doors.

Doors and frames shall be clearly marked with manufacturer's name, brand name, size, thickness, and identifying symbol or mark related to door numbers used in contract documents

Fiberglass reinforced plastic doors for this project shall conform to the following:

1. Flush construction, 44.5 mm thick, with no seams, cracks, or joints.
2. Made by the pulltrusion process with full length integral edge reinforcement.
3. Face shall not deviate more than 6.4 mm from a true plane at any point.
4. Reinforced to receive hardware specified, all ferrous reinforcement shall be ASTM A-276, Type 316 stainless steel.
5. Doors shall be prehung at factory and shall open inwards(left hand).
6. Resins:
 - a. Formulate for extremely corrosive environments.
 - b. Fire retardant formulation plus antimony trioxide to achieve an ASTM E84 flame spread of 25 or less and be self-extinguishing in accordance with ASTM D635.
 - c. Contain ultraviolet light inhibitor additives.
7. Prepare doors and frames for hardware only after receipt of hardware templates.
8. Make cutouts for openings at factory and furnish with pultruded FRP frames and stops that prevent moisture from entering or passing through the door.

9. Molded in one continuous piece.
10. Core of closed cell, non-absorptive, 64kg per cubic meter density, isocyanurate or polyurethane rigid foam.
 1. Finish: Semi-gloss surface. The color of the door shall be concrete grey to match as closely as possible the surrounding concrete.

Door louvers.

Door louvers shall be inverted V-type factory installed fiberglass louvers. Louvers shall not be removable from outside. Louvers shall have inside mounted bronze insect screens. A louver panel at least 0.16 square meters shall be provided near the bottom of the door in accordance with the manufacturer's standard practice.

Fiberglass Frame Requirements.

Fiberglass reinforced plastic doors frames for this project shall conform to the following:

- A. Frames shall be one-piece, pultruded FRP with double rabbeted profile, reinforced for the specified hardware, assembled with stainless steel fasteners, and furnished with wall anchors for installation after wall opening is complete. Frames shall include a threshold also of pultruded FRP.
- B. Furnished by door manufacturer with finish to match doors and prepared for hardware specified.
- C. Anchorage of frame to concrete shall be by stainless steel fasteners, as shown on the plans, as well as by expanded adhesive foam.

Sealants.

Sealants shall be ultraviolet and ozone resistant, gun grade polysulfide or polyurethane, multicomponent, Federal Specification: TT-S-227.

Threshold bedding sealant shall conform to Federal Specification: SS-C-153.

Hardware.

All hardware for the fiberglass reinforced plastic doors for this project shall be rated for extreme saltwater corrosion conditions. Doors shall be equipped with a heavy duty stainless steel lockset (with stainless steel lockguard) which is keyed from the outside but operable from the inside without a key. Doors shall be fitted with a heavy duty stainless steel door closer which can be locked to hold the door open. A floor mounted door stop shall be provided. All outside screws shall be tamper proof and hinge pins shall be non-removable.

Keying Instructions.

All door locks for the piers shall be keyed alike to operate with a single key.

Locks shall have cylinders with figure eight interchangeable cores with seven pin barrels. Permanent cores and keys shall be delivered to the Engineer for final installation at completion of project.

The Contractor shall also provide figure eight interchangeable cores for use during construction which shall remain the property of the State.

EXECUTION

Installation

Doors and frames at piers shall be installed at the completion of each pier and prior to completion of the internal stairs. The Contractor shall coordinate the rough in dimensions in the concrete with the door manufacturer prior to manufacture of the doors. Doors and frames shall be installed in accordance with manufacturer's written instructions using only noncorrosive materials and methods. Doors and frames shall be installed rigidly, securely, plumb and true and in such a manner that the doors operate freely without rubbing or binding. Clearance between frame and door shall be not more than 3 mm. The exterior frame shall be sealed weathertight.

Hardware items shall be accurately fitted, securely applied, and adjusted and lubricated in accordance with the manufacturer's instructions. Installation shall provide proper operation without bind or excessive play.

Thresholds shall be set in a continuous bed of sealant material.

Upon completion of installation and adjustment, the Contractor shall deliver to the Engineer all dogging keys, closer valve keys, lock spanner wrenches, and other factory furnished installation aids, instructions and maintenance guides.

WARRANTY

The fiberglass door manufacturer shall provide the State with a 10-year unconditional warranty to replace free of charge any fiberglass door or frame that experiences delamination or corrosion. The warranty shall include all construction costs related to replacement of the fiberglass door and frame, including hardware and keying.

PAYMENT

The contract unit price paid for fiberglass reinforced plastic door shall include full compensation for furnishing all labor, materials, equipment, and incidentals and for doing all the work involved in furnishing and installing the fiberglass reinforced plastic doors, complete in place, including frames and hardware, and the work of preparing shop drawings, as specified in these special provisions and as directed by the Engineer.

10-1.80 REINFORCED, RECYCLED PLASTIC (RRP) LUMBER -

Reinforced, Recycled Plastic (RRP) lumber shall consist of furnishing and installing the RRP in accordance with the details shown on the plans and as specified in the Standard Specifications and these special provisions.

Attention is directed to the provisions in "Order of Work" and to the "U.S. Coast Guard Preconstruction Checklist."

The Contractor shall submit working drawings for the RRP lumber to the Resident Engineer's Office, for approval in accordance with the provisions in Section 5-1.02, "Plans and Working Drawings" of the Standard Specifications and these special provisions. For initial review, 10 sets shall be submitted. The Engineer will require 3 weeks to review the working drawings after a complete set has been received, as determined by the Engineer. After review, between 6 and 12 sets, as requested by the Engineer, shall be submitted to the Office for final approval and for use during construction.

Within 2 weeks of the completion of installation of the RRP lumber, one set of reduced prints on 75-g/m² (minimum) bond paper, 279 mm x 432 mm in size, of the corrected original tracings of all working drawings for the RRP lumber shall be furnished to the Engineer. An index prepared specifically for the drawings containing sheet numbers and titles shall be included on the first reduced print in the set.

The edge of the corrected original tracing image shall be clearly visible and visually parallel with the edges of the page. A clear, legible symbol shall be provided on the upper left side of each page to show the amount of reduction and a horizontal and vertical scale shall be provided on each reduced print to facilitate enlargement to original scale.

The Contractor shall also submit suitable documents to the State verifying compliance to all material specifications for the RRP lumber. Submittals shall include: working drawings for all fabricated materials and reinforced recycled plastic, complete details of component layout and attachment details, mill test reports, performance test data and such material samples, manufacturer's literature, and other items that the State may require for verification of material compliance. The Contractor shall not order or fabricate any materials before obtaining the State's approval of such submittals.

MATERIALS

Materials for constructing the RRP lumber fenders shall conform to the following:

Connection Hardware

All metallic connection hardware shall be ASTM A276, Type 316 stainless steel, including anchors and couplers embedded in concrete. Nuts shall be heavy hex nuts, unless otherwise noted. Cut washers, at least 6.3mm thick, shall be used at all slotted, recessed and oversized holes bearing on RRP lumber or concrete. Recesses for bolt heads shall be drilled in recycled plastic lumber, for all outer sheathing members exposed to shipping traffic, as shown on the drawings. Bolt holes through composite marine timber shall be 3 mm larger than the bolt diameter, and slotted where shown on the drawings. Use two nuts, tightened securely and locked against each other, on each bolt or provide a lock washer between the nut and the cut washer.

Minimum capacities of bolted and lag-bolted connections of RRP lumber to RRP lumber and RRP lumber to concrete shall be established by full scale testing of the representative connections. Certified laboratory test results shall be submitted with the working drawings. If the bolt sizes shown on the drawings cannot provide the minimum required shear and pull out capacities shown on the drawings, then the Contractor shall provide larger diameter bolts and or additional hardware, as approved by the Engineer, to achieve the required minimum capacities.

Reinforced, Recycled Plastic Lumber

RRP lumber shall meet the requirements of a recycled product, and as such it must consist of not less than 50 percent by weight of secondary plus postconsumer waste and not less than 10 percent by weight of postconsumer waste. Postconsumer waste is defined as a finished material which would have been disposed of as a solid waste, having completed its life cycle as a consumer item, and does not include manufacturing waste. Secondary waste is defined as fragments of finished products of a manufacturing process, which process has converted a resource into commodity of real economic value, and includes postconsumer waste, but does not include excess virgin resources of the manufacturing process.

RRP lumber shall be a mixture of one or more of the following recycled post consumer or post industrial thermoplastics: high density polyethylene, low density polyethylene, or high density polypropylene. Appropriate colorants shall also be added to produce a black or dark brown color. Appropriate amounts of ultra-violet inhibitors and antioxidants shall also be mixed in to ensure that the resultant plastic meets the required physical properties specified below.

RRP lumber shall be cast or extruded into continuous and homogeneous lumber with no joints and with the full cross sectional dimensions (+/- 6 mm tolerance) that are shown on the drawings. The corners of the RRP lumber shall be radiused. Splices will not be allowed. RRP lumber shall have a smooth outer surface with a minimum of exposed voids and shall be straight and true, free of twist, curvature, bulging, and other undesirable deformation. Interior voids must not exceed 13 mmdiameter. At an exposed end of the member, there shall not be more than one void greater than 25 mm in diameter , and no more than 4 voids greater than 6 mm in diameter. RRP lumber shall be reinforced by a minimum of four deformed fiberglass reinforcing bars extending continuously through the length of the member, without splices. During the casting or extrusion process, reinforcing bars must be held firmly in the position shown on the drawings. RRP lumber shall consist of a dense outer skin not less than 6 mm thick surrounding a less dense core. Each piece of RRP lumber shall be permanently marked with the manufacturer's name.

RRP lumber shall have the physical properties as listed in the following table:

Plastic Only

Density (Skin) (ASTM D 792)	881 - 1009 kg/m ³
Density (Core) (ASTM D792)	545 - 753 kg/m ³
Compressive Modulus (Skin/Core) (ASTM D695)	262 MPa minimum
Ultimate Tensile Strength (Skin/Core) (ASTM D638)	3.45 MPa minimum at break
Bearing Strength (Skin/Core) (ASTM D953 Method A)	10.34 MPa minimum
Nail Pullout (Skin/Core) (ASTM D953 Method A)	267 N minimum
Impact Resistance (Skin) (ASTM D746, Modified)	Greater than 0.214 Nm/mm
Hardness (Skin) (ASTM D2240)	45-75 (Shore D)
Brittleness (Skin) (ASTM D746)	No break at -50°C at 0.267 Nm/mm
Chemical Resistance (Skin/Core) (ASTM D543)	Weight increases: Sea Water - less than 1.5% Gasoline - less than 7.5% No.2 Diesel - less than 6%
Abrasion (Skin) (ASTM D4060 for 10,000 cycles, CS17 wheel, and 1 kg load)	Weight loss - less than 0.5 g.
Coefficient of Friction (Skin) (ASTM D1894)	Wear index - 2.5 to 3.0
Ultraviolet Deterioration (Skin) (ASTM D4329 UVA-313; exposure cycle shall be 4 hours of ultraviolet (UV) exposure at 15.5°C (followed by 4 hours condensate (CON) exposure at 4.5°C	0.25 maximum, wet or dry For 500 hrs. exposure: Shore D durometer hardness shall not change more than 1%.
Water Absorption (Skin) (ASTM D570) (Core) (ASTM D570)	Weight increases: 24 hrs. - less than 0.5% 2 hrs. - less than 1.0% & 24 hrs. - less than 3.0%

Fiberglas Reinforcing Bars Only

Tensile Modulus (ASTM D638)	41,308 MPa minimum
Ultimate Tensile Strength (ASTM D638)	483 MPa minimum
Flexural Strength (ASTM D790)	483 MPa minimum
Compressive Strength (ASTM D695)	276 MPa minimum

RRP lumber as a Completed Unit

Flexural Modulus (Verify by approved full scale lab test)	300 x 300 mm – 1,700 MPa minimum 200 x 300 mm -- 2860 MPa minimum strong axis 200 x 300 mm - 1790 MPa minimum weak axis
Flexural Strength (Verify by approved full scale lab test)	300 x 300 mm - 17.9 MPa minimum 200 x 300 mm – 26.8 MPa minimum strong axis 200 x 300 mm - 22.7 MPa minimum weak axis

FABRICATION, HANDLING, STORAGE, AND INSTALLATION.—

All RRP lumber shall be the product of single manufacturer. RRP lumber shall be cut, beveled, drilled, countersunk, and otherwise fabricated in accordance to the manufacturer's recommendations by technicians who are skilled and experienced in the trade. Fabrication shall be done in the manufacturer's facilities to the greatest extent possible. The Contractor shall verify the location of mounting bolts and/or concrete inserts prior to drilling the RRP lumber.

RRP lumber shall be shipped in a manner that will minimize scratching or damage to outer surfaces. RRP lumber shall be stacked on skids at least 300 mm above the ground in a manner that will prevent sagging or water ponding and so that it may be readily inspected. RRP lumber shall be handled with ropes or nylon slings without dropping, bruising, or penetrating the surface with tools. RRP lumber damaged in shipping or handling will be rejected.

INSPECTION

As standard practice, the Engineer shall be given right of access to the RRP lumber manufacturing, assembly and test facilities.

Unless waived in writing, all RRP lumber acceptance testing shall be witnessed by the Engineer. The Manufacturer shall provide the Engineer with a minimum of two weeks notification prior to any planned acceptance testing.

WARRANTY

The RRP lumber manufacturer shall provide the State with a 10-year unconditional warranty to replace free of charge any RRP lumber that experiences transverse or longitudinal shrinkage or thermal cracking. The warranty shall include all construction costs related to replacement of the defective RRP lumber.

PAYMENT

RRP lumber will be measured and paid for by the cubic meter, as calculated using the gross dimensions shown on the plans. The contract price paid per cubic meter for reinforced, recycled plastic lumber shall include full compensation for furnishing all labor, materials, equipment, and incidentals and for doing all the work involved in furnishing and installing the reinforced, recycled plastic lumber, complete in place, including all mounting hardware, preparation of working drawings and testing of bolted connections, as specified in the Standard Specifications and these special provisions and as directed by the Engineer.

If a portion or all of the RRP is tested at a site more than 480 air line kilometers from both Sacramento and Los Angeles, additional shop inspection expenses will be sustained by the State. Payment to the Contractor for furnishing for composite marine timber will be reduced \$5,000 for each testing site located more than 480 air line kilometers from both Sacramento and Los Angeles.

10-1.81 SURVEY MONUMENT

This work shall consist of installing and surveying monuments as shown on the plans or as directed by the Engineer and as specified in these special provisions.

Survey monuments shall conform to the provisions in Section 81, "Monuments," of the Standard Specifications. Non shrink grout used to set the disks into cored holes shall conform to "Non Shrink Grout" of these special provisions.

In addition to the pier footing monuments, two permanent horizontal reference monuments shall be established off the bridge on the Abutment 1 side, at locations as approved by the Engineer. The horizontal reference monuments shall be located in an area that will not be disturbed by the construction activities and such that they can be used to sight on the new bridge.

After installation, the monuments shall be surveyed by a Land Surveyor, who is registered in the State of California. Survey notes with the locations and elevations of the new monuments shall be submitted to the State within 2 weeks of each completed survey.

Quantities of survey monument will be determined from actual count of the new monuments installed in the completed work.

MEASUREMENT AND PAYMENT

Survey monument shall be measured on per unit basis, based on an actual count of the monuments installed.

The contract unit price paid for survey monument shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in installing and surveying monuments, complete in place, including surveying and submitting survey notes, as shown on the plans, as specified in these special provisions, and as directed by the Engineer.

10-1.82 CHAIN LINK RAILING

Chain link railing shall conform to the provisions in Section 83-1, "Railings," of the Standard Specifications and these special provisions.

Chain link fabric shall be woven into an approximately 13-mm mesh. Mesh edges shall be knuckled. The chain link fabric shall be extruded 9-gage finish (3.76 mm), Type IV, Class 2A, bonded vinyl coated fabric, conforming to the requirements in AASHTO Designation: M 181. The color of the vinyl coating shall be black.

The strength of the bond between the coating material and steel of the bonded vinyl coated chain link fabric shall be equal to or greater than the cohesive strength of the polyvinyl chloride (PVC) coating material.

10-1.83 TUBULAR HANDRAILING (MODIFIED)

Tubular handrailing shall conform to the provisions in Section 83-1, "Railings," of the Standard Specifications.

10-1.84 CONCRETE BARRIER

Concrete barriers shall conform to the provisions in Section 83-2, "Barriers," of the Standard Specifications and these special provisions.

Type 25A concrete barriers will be measured and paid for as concrete barrier (Type 25 Modified).

Bar reinforcing steel for use in concrete barriers shall conform to the provisions in "Epoxy-coated Reinforcement," of these special provisions.

At the Contractor's option, epoxy-coated bar reinforcement for use in concrete barriers may be used in conformance with the following provisions:

- A. Bar reinforcement to be epoxy-coated shall conform to the ASTM Designation and grade required or permitted by Section 52-1.02A, "Bar Reinforcement," for the location or type of structure involved. The epoxy-coated bar reinforcement shall conform to the requirements in ASTM Designation: A 775/A 775M, except as provided herein. Fabrication and project site handling of the epoxy-coated bar reinforcement shall conform to the requirements in ASTM Designation: D 3963/D 3963M, except as provided herein.
- B. Appendix X1, "Guidelines For Job-Site Practices," of ASTM Designation: A 775/A 775M shall apply except as provided herein. The term "shall" shall replace the term "should" in this appendix. Section X1.2 shall not apply.
- C. Coatings shall be light green in color.
- D. Except for field welding of butt splices, all welding of reinforcement shall be complete prior to epoxy coating the reinforcement.
- E. When any portion of a reinforcing bar requires epoxy coating, the entire bar shall be coated.
- F. Within areas where epoxy-coated reinforcement is required, tie wire and bar chairs or other metallic devices used to secure or support the reinforcement shall be plastic-coated or epoxy-coated to prevent corrosion of the devices or damage to the coated reinforcement.
- G. Prior to coating, the Contractor shall furnish to the Transportation Laboratory, a representative 110 g sample from each batch of epoxy coating material to be used. Each sample shall be packaged in an airtight container identified with the manufacturer's name and batch number.
- H. Two 700-mm long samples of coated bar reinforcement from each size and from each load shipped to the project site shall be furnished to the Engineer for testing. These samples shall be representative of the material furnished. These samples, as well as any additional random samples taken by the Engineer, may be tested for specification compliance. Additional sampling, and all tests performed by the Engineer, may be performed at any location deemed appropriate by the Engineer. Failure of any sample to meet the requirements of the specifications will be cause for rejection.
- I. If any bar tested for coating thickness or for flexibility of coating fails to meet the requirements for coated bars in Section 8 of ASTM Designation: A 775/A 775M, 2 retests on random samples taken from bars represented by the failed test will be conducted for each failed test. If the results of both retests meet the specified requirements, the coated bars represented by the samples may be certified as meeting the test requirements.
- J. Epoxy-coated reinforcement shall be covered with an opaque polyethylene sheeting or other suitable protective material to protect the reinforcement from exposure to sunlight, salt spray and weather. For stacked bundles, the protective covering shall be draped around the perimeter of the stack. The covering shall be adequately secured; however, it should allow for air circulation around the reinforcement to prevent condensation under the covering. Epoxy-coated reinforcement shall not be stored within 300 meters of ocean or tidal water for more than 60 days.
- K. All visible damage to the coatings caused by shipping, handling or installation shall be repaired as required for repairing coating damaged prior to shipment as specified in ASTM Designation: A 775/A 775M. When the extent of coating damage prior to repair exceeds 2 percent of the bar surface area in any 300-mm length, repair of the bar will not be allowed and the coated bar will be rejected.

- L. The patching material and process shall be suitable for field application. The patching material shall be prequalified as required for the coating material and shall be either identified on the container as a material compatible with the bar reinforcement coating, or shall be accompanied by a Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications certifying that the material is compatible with the bar reinforcement coating. Damaged areas shall be patched in conformance with the patching material manufacturer's recommendations. If damage to a bar occurs during field bending, the area shall be patched immediately with the prequalified patching material.
- M. Except for lap splices, splices for epoxy-coated bar reinforcement shall be coated with a corrosion protection covering that is on the Department's list of approved products. The covering shall be installed in conformance with the manufacturer's recommendations and as directed by the Engineer. The list is available from the Transportation Laboratory.
- N. A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," shall be furnished for each shipment of epoxy-coated bar reinforcement certifying that the coated bars conform to the requirements of ASTM Designation: A 775/A 775M and Section 52-1.02B, "Epoxy-coated Bar Reinforcement." The Certificate of Compliance shall include all the certifications specified in ASTM Designation: A 775/A 775M and a statement that the coating material has been prequalified by acceptance testing performed by the Valley Forge Laboratories, Inc., Devon, Pennsylvania.

Concrete for use in concrete barriers shall contain not less than 400 kg of cement per cubic meter and shall be air-entrained concrete as provided under "Materials" of these special provisions.

Bar reinforcing steel for use in concrete barriers shall conform to the provisions in Section 52-1.02B, "Epoxy-coated Bar Reinforcement," of the Standard Specifications.

Exposed surfaces of concrete barriers on bridges or walls shall be cured with water as provided in Section 90-7.01A, "Water Method," of the Standard Specifications.

After completion of cure and surface finishing, the top surfaces and surfaces on the traffic side of concrete barriers on bridges or walls shall be sealed with a concrete sealant conforming to the following:

- A. The concrete sealant shall be a product designed to seal concrete against moisture. The sealant shall be 40 percent, minimum, organosilane solution, diluted in a suitable solvent, and shall consist of alkyltrimethoxysilanes with alkyl groups of i-butyl, i-octyl, n-octyl, singularly or in combination. When applied to a concrete surface that has been surface dry not less than 48 hours, the sealant shall seal the surface to the extent that 5 days after applying, a spray of water will not change the appearance of the concrete.
- B. The concrete sealant shall be tinted with a fugitive dye which colors the sealant on the concrete surface for at least 4 hours after application and then disappears within 7 days after application.
- C. Each shipment of concrete sealant shall be accompanied by the manufacturer's recommendations for application of concrete sealant and a Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

The concrete surface shall be dry for not less than 48 hours immediately before sealant is applied.

Concrete sealant shall be applied during periods of weather as recommended by the manufacturer except that the sealant shall be applied only when the atmospheric temperature is between 5°C and 38°C and when wind velocity is less than 2.25 m/s. The application of concrete sealant shall conform to the manufacturer's recommendations.

One coat of sealant shall be applied to the concrete surface at the coverage rate of approximately 2.5 m²/L. The sealant shall be applied using an airless sprayer with 140 kPa pressure, maximum. The sprayer shall be equipped with a calibrated pressure gage showing the pressure during the spraying operation. For small areas, if approved by the Engineer, rollers may be used to apply the sealant.

Subject to written approval of the Engineer, the Contractor may provide suitable enclosures to permit concrete sealing during inclement weather.

Approximately 24 hours after placement of the concrete sealer, the Contractor shall uniformly dampen the treated concrete surface using a fine water spray. The spray shall be sufficient to completely wet the surface without causing excessive runoff.

After 5 days following the sealant application, if required by the Engineer, the Contractor shall spray designated sealed concrete surfaces with a fresh water spray to verify sealant coverage. Surfaces determined to lack sufficient sealant coverage shall be resealed.

Full compensation for epoxy-coated bar reinforcement and sealing concrete barrier surfaces shall be considered as included in the contract price paid per meter for concrete barrier of the type or types listed in the Engineer's Estimate and no separate payment will be made therefor.

10-1.85 CHAIN LINK FENCE

Chain link fence shall be Type CL-1.8 and shall conform to the provisions in Section 80, "Fences," of the Standard Specifications.

Barbed wire supporting arms (extension arms) shall extend upwards from the tops of the fence posts at an approximate angle of 45 degrees and shall be fitted with clips or other suitable means for attaching 3 lines of barbed wire. The top outside wire shall be attached to the extension arm at a point approximately 300 mm above the top of the chain link fabric and 300 mm out from the fence line. The other wires shall be attached to the arm uniformly between the top of the fence and the top outside wire.

Barbed wire shall conform to the provisions in Section 80-3.01C, "Barbed Wire," of the Standard Specifications.

10-1.86 0.9 M, 2.7 M, 3.7 M, 4.9 M AND 7.3 M CHAIN LINK GATE

Chain link gates shall be Type CL-1.8 conforming to the provisions in Section 80, "Fences," of the Standard Specifications and these special provisions.

Gates shall be installed in existing fences at the locations shown on the plans. Gate installations shall be complete with gate post, latch post, concrete footings, braces, truss rods, and hardware. Gate and latch posts shall be braced to the next existing line post as shown on the plans.

At each gate location, an existing line post shall be removed and the new gate installed so that the gate is centered on the post hole of the removed post. Holes resulting from the removal of line posts shall be backfilled.

Gate mounting and latching hardware shall not contain open-end slots for the fastening bolts.

Chain link fabric for gates shall be of the same mesh size as the existing fence in which the gates are installed.

Openings made in existing fences for installation of gates shall be closed during the working day in which the openings are made and when work is not in progress. Temporary closures shall be made with the existing fence fabric or with additional 1.83-m chain link fabric as directed by the Engineer.

Full compensation for making the openings in existing fences, for temporary closing of the openings (including furnishing additional fence fabric if necessary), and for new posts, footings, hardware, braces, and truss rods shall be considered as included in the contract unit price paid for 0.9-m, 2.7-m, 3.7-m, 4.9-m and 7.3-m chain link gate Type CL-1.8 and no additional compensation will be allowed therefor.

10-1.87 CONCRETE BARRIER (TYPE 60)

Concrete barriers shall conform to the provisions in Section 83-2, "Barriers," of the Standard Specifications and these special provisions.

10-1.88 CRASH CUSHION (REACT)

Crash cushion (REACT) shall be furnished and installed as shown on the plans and in conformance with the provisions in the Standard Specifications and these special provisions.

Crash cushion (REACT) shall be a multiple recoverable type, manufactured by Roadway Safety Service, Inc. Crash cushion (REACT) and additional components shall conform to the descriptions as follows:

Contract Item Description	Manufacturer's Product Description
Crash Cushion (REACT 9SCBS)	REACT 350.9 Self Contained

The successful bidder can obtain the crash cushion from the following source:

A. Manufacturer: Roadway Safety Service, Inc., One East Wacker Drive, Suite 3000, Chicago, Illinois 60601.

B. Distributors:

1. Southern California: Traffic Control Service, Inc., 1881 Betmor Lane, Anaheim, California 92805, Telephone 1-800-222-8274, FAX 1-714-937-1070.
2. Northern California: Traffic Control Services, Inc., 8585 Thys Court, Sacramento, California 95828, Telephone 1-800-884-8274, FAX 1-916-387-9734.

The price quoted by the manufacturer for Crash Cushion (REACT 9CBS), for Channelview, Texas is \$33,500, not including sales tax.

The above prices will be firm for orders placed on or before 6/00, provided delivery is accepted within 90 days after the order is placed.

The prices quoted do not include the concrete backup block, concrete anchor slab or the W-Beam connection to barrier.

Crash cushion shall be installed in conformance with the manufacturer's recommendations.

Concrete anchorage devices used for attaching the crash cushion to the base slab shall be limited to those which have been proven satisfactory for such application by previous testing.

The W-Beam connections to barrier shall conform to the provisions in Section 83-1, "Railings," of the Standard Specifications.

High strength bolts and nuts for W-Beam connections to barrier shall conform to the requirements in ASTM Designation: A 325 or A 325M and A 563 or A 563M, respectively.

The Contractor shall furnish the Engineer one copy of the manufacturer's plan and parts list for each model installed.

The Contractor shall provide the Engineer with a Certificate of Compliance from the manufacturer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The Certificate of Compliance shall certify that crash cushion conforms with the contract plans and specifications, conforms to the prequalified design and material requirements, and was manufactured in conformance with the approved quality control program.

Crash cushion will be measured by the unit as determined from actual count in place in the completed work.

The contract unit prices paid for crash cushion (REACT 9SCBS) shall include full compensation for furnishing all labor, materials (including anchor bolts, nuts, washers, and marker panels), tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing the crash cushions, complete in place, including structure excavation, structure backfill, bar reinforcing steel, concrete for backup block and anchor slab, transition plate, W-beam connector, and for furnishing high strength bolts and plate washers, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.89 THERMOPLASTIC TRAFFIC STRIPE AND PAVEMENT MARKING

Thermoplastic traffic stripes (traffic lines) and pavement markings shall be applied in conformance with the provisions in Section 84, "Traffic Stripes and Pavement Markings," of the Standard Specifications and these special provisions.

Where striping joins existing striping, as shown on the plans, the Contractor shall begin and end the transition from the existing striping pattern into or from the new striping pattern a sufficient distance to ensure continuity of the striping pattern.

Thermoplastic material shall conform to the requirements in State Specification 8010-19A.

Thermoplastic material for traffic stripes shall be applied at a minimum thickness of 2.03 mm.

At the option of the Contractor, permanent striping tape as specified in "Approved Traffic Products" of these special provisions, may be placed instead of the thermoplastic traffic stripes and pavement markings specified herein, except that 3M, "Stamark" Series A320 Bisymmetric Grade, manufactured by the 3M Company, shall not be used. Pavement tape, if used, shall be installed in conformance with the manufacturer's specifications. If pavement tape is placed instead of thermoplastic traffic stripes and pavement markings, the pavement tape will be measured and paid for by the meter as thermoplastic traffic stripe and by the square meter as thermoplastic pavement marking.

10-1.90 INSTALL SEISMIC MONITORING CASING

Install seismic monitoring casing shall consist of drilling into soil and rock, sampling soil and rock, providing a log of test borings and a boring report, and furnishing and installing casing for seismic monitoring equipment at the downhole locations shown on the plans in the vicinity of Pier 8. Seismic monitoring casing shall be in accordance with the details shown on the plans and these special provisions.

Install seismic monitoring casing includes the following operations in the following order:

1. Drill 115 mm diameter hole, perform Standard Penetration Tests (SPT) and collect rock cores, and prepare a log of test borings and boring report.
2. Allow State forces to perform P-S suspension logging.
3. Drill 205 mm diameter hole for installation of casing.
4. Furnish and install 105 mm diameter polyvinyl chloride (PVC) pipe casing, including equipment furnished and attached to the bottom of the casing by the State.
5. Grout the annulus between the 205 mm diameter hole and the 105 mm diameter casing, and install pipe cap.

MATERIALS.--The seismic monitoring casing shall consist of 105 mm diameter Schedule 80 screw joint (flush) polyvinyl chloride PVC pipe. Each screw joint shall include an O-ring and shall be sealed with an O-ring lubricant.

The casing will have a specially formed sealed cap (Bishops Hat) at the bottom with instrumentation cables extending up through the casing. The Bishops Hat and instrumentation cables will be furnished and installed by State forces.

Grout for placement in the annular space between the casing and the hole shall be proportioned as follows:

Grout Type	Downhole	Grout Proportion
A	The shallow hole (11 meters).	4 sacks of cement, and 0.5 sack of bentonite per 190 liters of water.
B	The deep hole (30 meters)	5 sacks of cement, and 0.25 sack of bentonite per 190 liters of water.

The Contractor shall furnish sufficient quantities of grout for filling the annular space between the casing and the hole.

BORINGS.--Borings shall consist of drilling holes, taking samples, logging borings and furnishing test boring submittals to the Engineer.

The "Soil and Rock Logging Classification Manual" is included in the "Materials Information" available to the Contractor as provided for in Section 2-1.03, "Examination of Plans, Specifications, Contract, and Site of Work," of the Standard Specifications.

The Contractor shall drill borings at the center of each downhole location as shown on the plans and as directed by the Engineer.

The Contractor shall notify the Engineer in writing not less than 10 working days in advance of drilling borings.

All borings shall be made under site supervision of a Geologist. The log of test borings shall be stamped by, and the test boring submittal shall be signed by a geologist who is registered in the State of California and has at least five years of geotechnical engineering experience of deep foundations in both soil and rock.

Borings shall be made by rotary drill methods and shall be at least 76 mm in diameter.

Borings shall be drilled to a depth equal to that of the deepest hole at the downhole location.

Standard Penetration Tests (SPT) shall be made in all soil types and performed in accordance with ASTM D1586 in each test boring at 765 mm maximum intervals and terminate when bedrock is encountered. Soil classification and descriptions shall conform to the requirements for visual-manual procedures in ASTM D 2488.

Bedrock shall be continuously cored with at least 90% core recovery. Rock shall not be logged from drill cuttings. Rock quality designation (RQD) shall be made taken at 1.5 meter maximum intervals. Rock shall be cored using an outer and inner core barrel drilling system. The outer core barrel shall be fitted with either a diamond impregnated or polycrystalline drill bit and have an outside diameter of at least 115 mm. The split inner tube core barrel shall have an inside diameter of at least 50 mm.

Prior to removal from the split inner tube barrels and placement into core boxes, rock cores shall be photographed. After core boxes are filled, and prior to removal from the drilling platform, rock cores shall be photographed. All rock core photographs shall be color, 127 mm x 177 mm, and labeled with the bore hole number, sample elevation, scale, and date and time photographed.

The rock cores shall be retained in rock core boxes that are labeled with the job contract number, the pile location, and the sample elevation. Rock core boxes shall become the property of the State and will removed from the job site by the State. Prior to their removal from the job site, the Contractor shall preserve and secure the rock core samples in a weather protected facility until notified by the Engineer.

The log of test borings including the soil and rock classification shall conform to the document "Soil and Rock Logging Classification Manual: Field Manual," published by the Engineering Service Center, Caltrans, dated August 1995.

After completion of all borings, the Contractor shall furnish to the Engineer a test boring submittal that includes photographs of rock cores, a boring report and the log of test borings.

The log of test borings shall conform with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. All log of test borings shall be 560 mm x 864 mm in size. For initial review, 4 sets of drawings shall be submitted to the Engineer. Within 3 weeks after final approval of the test boring submittal, one set of the corrected prints on 27 kg (minimum) good quality bond paper, 560 mm x 864 mm in size, prepared by the Contractor shall be furnished to the Office of Structure Design, Documents P.O. Box 942874, MS#9, Sacramento, CA 94274-0001 (1801 30th Street, Sacramento, CA 95816) and 7 sets furnished to the Engineer.

Log of test borings shall show the State assigned designations for the contract number, bridge number, full name of the structure as shown on the contract plans, and District-County-Route-Post mile on each sheet. The test boring/geotechnical subcontractor name, address, and phone number shall be shown on the working drawings. Each sheet shall be numbered in the lower right hand corner and shall contain a blank space in the upper right hand corner for future contract sheet numbers. The following shall be shown on the log of test borings:

1. Stationing and offset of boring.
2. Northing and easting coordinates.

3. Reference elevation and datum.
4. Boring start and completion date.
5. Geotechnical notes and miscellaneous explanations.
6. Drill bit and sampler types and diameters.
7. Percent of core recovery and RQD.
8. Sample numbers.
9. SPT data.
10. Depth increments of borings.
11. Graphic log.
12. Soil classifications and descriptions.
13. Rock classifications and descriptions.
14. Log symbol legend.
15. Signature and seal of the Geologist or Civil Engineer.

The boring report shall include the following:

1. Summary of drilling methods, drilling equipment, drill platforms, and any drilling difficulties encountered.
2. Location map of the surveyed position of the borings relative to the existing pier (in California Coordinate System and bridge stationing).
3. Bore hole surveying notes.
4. Photographs of rock cores.
5. Copies of original daily drilling notes.

The Engineer will notify the Contractor in writing when a boring submittal is complete and approved.

All materials utilized in making boring shall be disposed of in accordance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications, and to the requirements of the non-storm water discharges in the "Caltrans Storm Water Quality Handbook, Construction Contractor's Guide and Specifications" as specified in the Section entitled "Water Pollution Control" elsewhere in these special provisions.

P-S SUSPENSION LOGGING.--P-S suspension logging, consisting of P-wave and S-wave (dilatational wave and shear wave) velocity measurements, will be made by State forces. P-S suspension logging will be made after completion of the Contractor's boring, sampling, and logging operations. The Contractor shall notify the Engineer in writing not less than 10 working days prior to completing boring, sampling, and logging operations in order for the State forces to be on site to perform P-S suspension logging. The Contractor shall allow 3 working days for the State forces to complete P-S suspension logging.

INSTALL CASING.--The seismic monitoring casing shall be installed into an 205 mm diameter hole. The hole shall be drilled by mud rotary methods and shall be centered over the 115 mm diameter hole described in the section "Borings" in these special provisions.

The 105 mm diameter pipe casing shall be installed from the ground surface to the depth as shown on the plans unless directed by the Engineer (using the P-S suspension logs). The Contractor shall notify the Engineer in writing not less than 15 working days prior to installing the casings in order for personnel from CDMG to attach the Bishops Hat to the casing. CDMG personnel will be on site for the installation and grouting of the casings.

Grout shall be delivered at the low end of the void being filled by methods that prevent the mixing of grout with water during charging of the grout delivery tubes and placement of the grout. Until at least 3 meters of grout has been placed, the tips of grout delivery tubes shall be within 155 mm of the bottom of the void being filled. The grout delivery tubes may be raised during grouting, providing that the embedment of the tips are maintained at least 1.8 meter below the top surface of the grout.

Sufficient grout shall be injected to fill the annular space between the casing and the hole and be expelled at the top of the hole until there is no evidence of entrapped air or water. A minimum grout head of 610 mm shall be maintained above the top of the hole until the grout has set.

All residue from the grouting operation shall be removed after completing the grouting operations and shall be disposed of in accordance with Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications, and to the requirements of the non-storm water discharges in the "Caltrans Storm Water Quality Handbook, Construction Contractor's Guide and Specifications" as specified in the Section entitled "Water Pollution Control" elsewhere in these special provisions.

MEASUREMENT AND PAYMENT.--Seismic monitoring system casing shall be measured and paid for as install seismic monitoring casing. The length of seismic monitoring casing to be paid for shall be the total length in place in the completed work, measured from the bottom tip of the casing to the ground surface.

The contract price lump sum paid for install seismic monitoring casing shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing the casings, complete in place, including drilling into soil and rock, SPT sampling, collecting soil and rock cores, preparing a log of test borings and boring report, furnishing and installing casing, grouting, and disposing of material resulting from drilling holes and grouting, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.91 PAVEMENT MARKERS

Pavement markers shall be placed in conformance with the provisions in Section 85, "Pavement Markers," of the Standard Specifications and these special provisions.

Retroreflective pavement markers shall comply with the specific intensity provisions for reflectance after abrading the lens surface in conformance with the "Steel Wool Abrasion Procedure" specified for pavement markers placed in pavement recesses in Section 85-1.05, "Retroreflective Pavement Markers," of the Standard Specifications.

Retroreflective pavement markers placed in pavement recesses will be measured and paid for as pavement marker (retroreflective-recessed).

10-1.92 SUBGRADE ENHANCEMENT FABRIC

Subgrade enhancement fabric shall be placed where shown on the plans and locations designated by the Engineer in accordance with these special provisions.

Subgrade enhancement fabric shall be manufactured from one or more of the following materials: polyester, nylon or polypropylene.

Subgrade enhancement fabric shall conform to the following:

	Woven	Non-Woven
Weight, Newton per Square Meter, Min.	2.03	2.03
ASTM Designation: D3776		
Grab Tensile Strength, Newton, Min.	890	801
ASTM Designation: D4632		
Modulus (Tensile Strength at 10% Elongation) Newton, Min.	490	_____
ASTM Designation: D4632		
Elongation at Break, Percent, Maximum	35 Max.	50 Min.
ASTM Designation: D4632		

Subgrade enhancement fabric shall be furnished in an appropriate protective cover which shall protect it from ultraviolet radiation and from abrasion due to shipping and handling, and shall remain in said cover until installation.

Subgrade enhancement fabric shall be accompanied by a Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificate of Compliance," of the Standard Specifications.

The subgrade to receive the fabric, immediately prior to placing, shall conform to the compaction and elevation tolerance specified in Section 25-1.03, "Subgrade," of the Standard Specifications and these special provisions and shall be free of loose or extraneous material and sharp objects that may damage the fabric during installation.

Subgrade enhancement fabric shall be handled and placed in accordance with the manufacturer's recommendation and shall be positioned longitudinally along the alignment, pulled taut to form a tight wrinkle-free mat.

Adjacent borders of the fabric shall be overlapped a minimum of 450 mm.

The amount of subgrade enhancement fabric placed shall be limited to that which can be covered with aggregate subbase material within 72 hours.

Should the fabric be damaged during placing, the damaged section shall be repaired by placing a new piece of fabric over the damaged area. Said piece of fabric shall be large enough to cover the damaged area and provide a minimum 900 mm overlap on all edges.

Damage to the fabric resulting from the Contractor's vehicles, equipment, or operations shall be repaired at the Contractor's expense.

During spreading and compaction of the aggregate subbase material, vehicles or equipment shall not be driven directly on the fabric. A sufficient thickness of material shall be maintained between the fabric and the equipment to prevent damage to the fabric.

The quantity of subgrade enhancement fabric to be paid for will be measured by the square meter of area covered, not including additional fabric for overlap.

The contract price paid per square meter for subgrade enhancement fabric shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in placing the fabric, complete in place as shown on the plans, as specified in these special provisions, and as directed by the Engineer.

10-1.93 PRECAST CONCRETE BOX CULVERTS

Precast concrete box culvert shall conform to the provisions in Section 51, "Concrete Structures," of the Standard Specifications and the following:

10-1.94 LIGHTWEIGHT EMBANKMENT MATERIAL (CELLULAR CONCRETE)

The work shall consist of constructing a lightweight embankment material (cellular concrete) to the lines, grades, and dimensions shown on the plans, in accordance with the Standard Specifications, these special provisions and as directed by the Engineer.

The Contractor shall furnish a mix design which will produce a cast density (at point of placement) of 4.0 to 6.6 kN/m³ with a minimum compressive strength of 280 kPa to 825 kPa at 28 days, respectively. The Contractor shall provide the Engineer with a Work Plan of the equipment and procedures proposed at least 10 working days prior to placement; items in the submittal shall include:

1. Material list of items; manufacturer's specifications;
2. Mix design(s), including laboratory data using the mix design verifying mass and strength requirements.

Admixtures for accelerating the set time may be used in accordance with the manufacturer's recommendations. A foaming agent shall be used and shall be tested in accordance with ASTM C 796. Mixing water shall be potable and free of deleterious amounts of acids, alkali, salts, oils, and organic materials which would adversely affect the setting or strength of the Lightweight Embankment Material (cellular concrete).

Portland Cement shall comply with ASTM C150, Types I, II, or III. Pozzolans and other cementitious materials may be used when specifically approved by the manufacturer of the foaming agent.

At the point of placement, the density shall be in accordance with the specified cast density. A single cast density test shall represent the lesser of 230 cubic meters or one day's production.

The compressive strength shall be tested in accordance with ASTM C 495 except as follows:

1. Unless otherwise approved by the Engineer, the specimens shall be 76.2 mm (3-inch) by 152.4 mm (6-inch) cylinders. During molding, place the concrete in two approximately equal layers, and raise and drop the cylinders approximately 25 mm three times on a hard surface after placing each layer; no rodding shall be allowed. Specimens shall be covered and protected immediately after casting to prevent damage and loss of moisture.
2. Specimens shall be moist cured in the molds for a period of seven (7) days prior to the 28-day compressive strength test. Specimens shall not be oven dried.

Lightweight embankment material (cellular concrete) shall be placed to the designated dimensions as specified in Sections 19-1.03, "Grade Tolerance,".

Lift thickness for lightweight embankment material (cellular concrete) shall not exceed 0.6 m. If more than one lift is required, the layer to receive the next lift shall be scarified with a broom or rake to provide surface roughness. After curing for 12 hours, any crumbling area on the surface should be removed and scarified before the next layer is placed. Surface stepping shall be limited to 125 mm. Grades of up to 5 percent may be made by adding a thickening agent to the mix, in conformance with the manufacturer's recommendations.

If more than one lift is required, the layer to receive the next lift shall be scarified with a broom or rake to provide surface roughness. After curing for 12 hours, any crumbling area on the surface should be removed and scarified before the next layer is placed. Surface stepping shall be limited to 125 mm. Grades of up to 5 percent may be made by adding a thickening agent to the mix, in conformance with the manufacturer's recommendations.

A minimum 12-hour waiting time between lifts shall be required. If ambient temperatures are anticipated to be below 4.5 C within 24 hours after placement, the mixing water should be heated when specifically approved by the manufacturer of the foaming agent, or placement shall be prohibited during such period. Placement shall not be allowed on frozen ground.

Lightweight embankment material (cellular concrete) shall be job site batched, mixed with the foaming agent, and placed with specialized equipment certified by the manufacturer. Cement and water may be premixed and delivered to the site; and foam shall be added at the site. Slurry coats and multilayer casting are acceptable methods of installation. Subgrade to receive lightweight embankment material (cellular concrete) shall be free of all loose and extraneous material. Subgrade shall be uniformly moist, and any excess water standing on the surface shall be removed prior to placing lightweight embankment material (cellular concrete).

After placing the final lift of lightweight embankment material (cellular concrete), the exposed surface of shall be covered with a prime coat. The prime coat shall conform to the requirements in Section 94, "Asphaltic Emulsions," of the Standard Specifications. A prime coat of SS-1 shall be applied uniformly at a rate of between 0.68 and 1.13 liters per square-meter, with the exact rate determined by the Engineer.

Pay quantities for lightweight embankment material (cellular concrete) will be measured by the cubic meter, to the lines and grade shown on the plans and as directed by the Engineer.

The contract price paid per cubic meter for lightweight embankment material (cellular concrete) shall include full compensation for furnishing all labor, materials (including furnishing and applying the prime coat), tools, equipment, and incidentals, and for doing all the work involved in furnishing and placing, the lightweight embankment material (cellular concrete), complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.95 EMERGENCY RESPONSE CONTINGENCY PLAN

Attention is directed to Section 7-1.06, "Safety and Health Provisions" of the Standard Specifications. The location of the New Benicia Bridge Project is in the vicinity of several refineries and chemical processing plants. The contractor shall prepare and submit to the Engineer a contingency plan for responding to or dealing with chemical or physical hazards that may occur during and as a result of a disaster or accident at a refinery or chemical processing plant.

The contingency plan shall identify all potential hazards from any refineries and chemical processing plants within 8,000 meters of the project site including hazards from any rail cars, trucks, and ships that operate to and from these facilities. The contingency plan shall include instructions and procedures for identifying and responding to a potential hazard and will conform to all local Community Emergency Response Plans that exist for the cities and counties adjacent to the job site.

The contractor will ensure all personnel working at the job site are aware of all potential hazards and will conduct disaster response drills every 180 days. The contractor will coordinate all disaster response drills with the cities and counties adjacent to the job site.

The contingency plan shall be reviewed and updated at least every 180 calendar days.

Full compensation for conforming to the requirements of this section shall be considered as included in the contract prices paid for the various contract items of work and no additional compensation will be allowed therefor.

10-1.96 TEMPORARY RETAINING WALL

A temporary retaining wall may be constructed at the Contractor's option to provide access.

The Contractor shall submit to the Engineer, for approval, working drawings and design calculations for the proposed temporary retaining wall at **21.7 m RT. BM 43+50 to 21.7 m RT. BM 45+40**. Such drawings and design calculations shall be signed by an engineer who is registered as a Civil Engineer in the State of California. Five sets of the drawings and one copy of the design calculations shall be furnished. The drawings shall be submitted at least 8 weeks in advance of the time the Contractor begins construction of the retaining wall.

Attention is directed to Section 5-1.02, "Plans and Working Drawings" of the Standard Specifications. Working drawings for the retaining wall shall include, but not be limited to:

1. Descriptions and values of all loads
2. Stress sheets
3. Shop details
4. Erection and removal plans
5. Equipment lists
6. Other details as necessary

The Contractor shall allow 4 weeks after complete drawings and all support data are submitted to the Engineer for the review of any temporary retaining wall plans.

The Contractor may revise approved temporary retaining wall drawings provided sufficient time is allowed for the Engineer's approval before construction begins on the revised portions. Such additional time will not be more than that which

was originally allowed. Construction of the temporary retaining wall shall not begin until the drawings for the temporary retaining wall have been approved by the Engineer.

After the adjacent construction activity has been completed and the retaining is no longer needed to allow access for equipment, the Contractor shall remove the temporary retaining wall

Temporary retaining wall will be measured and paid for by the square meter. Regardless of the type of retaining wall actually constructed, the square meter area for payment will be based on the vertical height and length of retaining wall shown on the plans which was or would have been constructed. The vertical height of retaining wall will be taken as the difference in elevation from the finished grade to the top of the wall.

The contract price paid per square meter for temporary retaining wall shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the temporary retaining wall and inspection elements, including earthwork, piles, footings, and drainage systems, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions and as directed by the Engineer.

Full compensation for revisions to the barrier support, drainage system, or other facilities made necessary by the use of a temporary retaining wall shall be considered as included in the contract price paid per square meter for temporary retaining wall and no separate payment will be made therefor.

SECTION 10-2. (BLANK)

SECTION 10-3. SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS

10-3.01 DESCRIPTION

Traffic signals, lighting, sign illumination, traffic operations system, call box, electrical facilities, conduit layout, grounding layout, marine navigational aids systems and health monitoring system (shipping channel span) shall conform to the provisions in Section 86, "Signals, Lighting and Electrical Systems," of the Standard Specifications and these special provisions.

10-3.02 COST BREAK-DOWN

Cost break-downs shall conform to the provisions in Section 86-1.03, "Cost Break-Down," of the Standard Specifications and these special provisions.

The Engineer shall be furnished a cost break-down for each contract lump sum item of work described in this Section 10-3.

The cost break-down shall be submitted to the Engineer for approval within 20 days after the contract has been approved. The cost break-down shall be approved, in writing, by the Engineer before any partial payment for the items of electrical work will be made.

The cost breakdown shall include the following items in addition to those listed in the Standard Specifications:

- Junction boxes - each type
- Cable tray supports
- Channel struts
- Conduit body or condulets - each type
- Conduit expansion joints
- Feed through outlet boxes
- Lanterns -each type
- Radar beacons
- Training for radar beacon system
- Flashing beacons
- Flashing beacon control transmitter and receiver
- Fog signal
- Solar modules
- SOW cable

10-3.03 MAINTAINING EXISTING AND TEMPORARY ELECTRICAL SYSTEMS

Traffic signal system shutdowns shall be limited to periods between the hours of 10:00 a.m. and 3:00 p.m.

At least three working days prior to performing any work on each existing city system, the Contractor shall notify the Engineer and the City Engineer of Martinez at telephone number (925) 313-7054.

10-3.04 FOUNDATIONS

Sleeve nuts shall be used on Type 1-B standard. Foundations for Type 1-B standards shall conform to the details on Standard Plan ES-7B, "Anchor Bolts With Sleeve Nuts", except that the bottom of the base plate shall be flush with the finished grade.

10-3.05 STANDARDS, STEEL PEDESTALS AND POSTS

Where the plans refer to the side tenon detail at the end of the signal mast arm, the applicable tip tenon detail may be substituted.

The sign mounting hardware shall be installed at the locations shown on the plans.

Mast arm mounted street name signs shall be installed on signal mast arms at the locations shown on the plans. The street name signs and mounting hardware (except straps, seals and saddle brackets) will be State-furnished in conformance with the provisions in "Materials" of these special provisions. The State-furnished hanger assembly will be similar to that shown for internally illuminated street name signs. The mounting hardware and sign shall be assembled. The assembly shall be attached to the mast arm using a 19 mm x 0.53 mm stainless steel strap in a manner similar to the strap and saddle bracket method shown on the plans. The band shall be wrapped at least twice around the mast arm, tightened, and secured with a stainless strap seal in the same manner shown for strap and saddle bracket sign mounting. Straps, seals and saddle brackets shall be furnished by the Contractor. The sign panel shall be leveled and hardware securely tightened.

Type 1 standards shall be assembled and set with the handhole on the downstream side of the pole in relation to traffic or as shown on the plans.

The sheet titles for Standard Plans ES-7C, ES-7D and ES-7E are amended to read, as follows:

Standard Plan	Title
ES-7C	Signal and Lighting Standards Case 1 Arm Loading Wind Velocity=129 km/h Arm Lengths 4.6 m to 9.1 m
ES-7D	Signal and Lighting Standards Case 2 Arm Loading Wind Velocity=129 km/h Arm Lengths 4.6 m to 9.1 m
ES-7E	Signal and Lighting Standards Case 3 Arm Loading Wind Velocity=129 km/h Arm Lengths 4.6 m to 13.7 m

10-3.06 CONDUIT

Conduit to be installed underground shall be Type 1 or Type 3 unless otherwise specified. Detector termination conduits shall be Type 3 .

The conduit in a foundation and between a foundation and the nearest pull box shall be Type 1.

Conduit sizes shown on the plans and specified in the Standard Specifications and these special provisions are referenced to metallic type conduit. When rigid non-metallic conduit is required or allowed, the nominal equivalent industry size shall be used as shown in the following table:

Size Designation for Metallic Type Conduit	Equivalent Size for Rigid Non-metallic Conduit
21	20
27	25
41	40
53	50
63	65
78	75
103	100

When a standard coupling cannot be used for joining Type 1 conduit, a UL listed threaded union coupling conforming to the provisions in Section 86-2.05C, "Installation," of the Standard Specifications, or a concrete-tight split coupling, or concrete-tight set screw coupling shall be used.

When Type 3 conduit is placed in a trench (not in pavement or under portland cement concrete sidewalk), after the bedding material is placed and the conduit is installed, the trench shall be backfilled with commercial quality concrete, containing not less than 250 kg of portland cement per cubic meter, to not less than 100 mm above the conduit before additional backfill material is placed.

Conduit runs shown on the plans to be located behind curbs may be installed in the street, within 0.9-m of, and parallel with the face of the curb, by the "Trenching in Pavement Method" in conformance with the provisions in Section 86-2.05C, "Installation," of the Standard Specifications. Pull boxes shall be located behind the curb or at the locations shown on the plans.

After conductors have been installed, the ends of conduits terminating in pull boxes, service equipment enclosures, and controller cabinets shall be sealed with an approved type of sealing compound.

At those locations where conduit is required to be installed under pavement and existing underground facilities require special precautions in conformance with the provisions in "Obstructions" of these special provisions, conduit shall be placed by the "Trenching in Pavement Method" in conformance with the provisions in Section 86-2.05C, "Installation," of the Standard Specifications.

At other locations where conduit is required to be installed under pavement and if a delay to vehicles will not exceed 5 minutes, conduit may be installed by the "Trenching in Pavement Method."

At the option of the Contractor, the final 0.6-m of conduit entering a pull box in a reinforced concrete structure may be Type 4.

GALVANIZED RIGID STEEL CONDUIT, THREADED COUPLINGS, AND-ELBOWS

The galvanized rigid steel (GRS) conduit, threaded couplings, and elbows shall conform to the following requirements:

- a. The conduit, threaded couplings, and elbows shall conform to the Federal Specification WW-C581E, UL Standard #6, and ANSI specification C80.1. The conduit, threaded couplings, and elbows zinc surfaces shall remain intact and undistributed on both the inside and outside throughout the preparation and application processing.
- b. The conduit, threaded couplings, and elbows shall be "Hot dipped" galvanized inside and outside after fabrication with hot dipped galvanized threads. The zinc coating for conduit, threaded couplings, and elbows shall be tested in accordance with ASTM Designation: A239.
- c. The "Hot Dipped" galvanized threads for conduit and elbows shall be coated with urethane.
- d. The "Hot Dipped" galvanized threads for threaded coupling shall have an urethane coated of a nominal thickness of 50 micron.
- e. The conduit, threaded couplings, and elbows interior shall have an urethane coated of a nominal thickness of 50 micron.
- f. The conduit shall be bendable without damage to the interior urethane coating.

POLYVINYL CHLORIDE COATED GALVANIZED RIGID STEEL CONDUIT, THREADED COUPLINGS, AND ELBOWS

The polyvinyl chloride (PVC)-coated galvanized rigid steel (GRS) conduit, threaded couplings and elbows shall conform to the galvanized rigid steel conduit, threaded couplings, and elbows as specified elsewhere in these special provisions with the following additional requirements:

- a. All PVC coated GRS conduit, threaded couplings and elbows shall conform to NEMA standard No. RN-1. The bond between the coatings and the metal shall be greater than the tensile strength of the coatings.
- b. All PVC coated GRS threaded couplings exterior shall have an urethane coating of a nominal thickness of 50 micron before the PVC coating is applied.
- c. All PVC coated GRS conduit, threaded couplings and elbows shall have an exterior PVC coating of minimum thickness of 1 mm applied by dipping in liquid plastisol. All PVC coated GRS threaded couplings shall have longitudinal ribs to enhance installation. All Hubs on PVC coated GRS threaded couplings shall have a PVC sleeve extending one pipe diameter or 53 mm, whichever is less. The inside diameter of the sleeve shall be equal to the outside diameter of the uncoated pipe.
- d. The PVC coated GRS conduit shall be bendable without damage to the exterior PVC coating.

POLYVINYL CHLORIDE COATED GALVANIZED RIGID STEEL CONDUIT BODIES

The polyvinyl chloride (PVC)-coated galvanized rigid steel conduit bodies shall conform with the following requirement before the PVC coating is applied:

- a. The PVC-coated galvanized rigid steel conduit bodies shall conform to Federal Specification W-C-586D, and UL Standard #514B. The PVC-coated galvanized rigid steel conduit bodies zinc surfaces shall remain intact and undistributed on both the inside and outside throughout the preparation and application processing.
- b. The PVC-coated galvanized rigid steel conduit bodies shall be "Hot dipped" galvanized inside and out after fabrication with hot dipped galvanized threads. The zinc coating for PVC-coated galvanized rigid steel conduit bodies shall be tested in accordance with ASTM Designation: A239.

- c. The "Hot Dipped" galvanized threads, the exterior, and the interior for the PVC-coated galvanized rigid steel conduit bodies shall have an urethane coating of a nominal thickness of 50 micron.
- d. The PVC-coated galvanized rigid steel conduit bodies shall conform the following requirements when the PVC coating is applied:
 - e. All PVC-coated galvanized rigid steel conduit bodies shall conform to NEMA standard No. RN-1.
 - f. The bond between the coatings and the metal shall be greater than the tensile strength of the coatings.
 - g. All PVC-coated galvanized rigid steel conduit bodies shall have an exterior PVC coating of a minimum thickness of 1 mm applied by dipping in liquid plastisol.
 - h. All Hubs on PVC-coated galvanized rigid steel conduit bodies shall have a PVC sleeve extending one pipe diameter or 53 mm, whichever is less. The inside diameter of the sleeve shall be equal to the outside diameter of the uncoated pipe.
 - i. Stainless steel encapsulated screws shall be supplied with all form 7 and form 8 PVC-coated galvanized rigid steel conduit bodies.
- A. The PVC coating on all form 8 PVC-coated galvanized rigid steel conduit bodies shall form a gasket-like flange of at least 8 mm wide and 1 mm thick covering the top of the conduit body around the opening.
- B. The PVC-coating on all form 8 conduit body covers shall form a gasket-like flange of at least 8 mm wide and 1 mm thick covering at the bottom of the cover and mating with the flange of the conduit body.
- C. All PVC-coated galvanized rigid steel conduit bodies for conduits less than 103 mm shall be form 7 conduit bodies.

10-3.07 JUNCTION AND OUTLET BOXES

NEMA TYPE 4X CONTINUOUS HINGE JUNCTION BOX

NEMA Type 4X continuous Hinge Junction Box should be constructed as follows:

- a. Type 5052 H-32 aluminum min.2 mm thick
 - b. Seams continuously welded and grounded smooth, no holes or knockouts
 - c. Door and body stiffeners in larger enclosure
 - d. Rolled lip around three sides of door and all sides of enclosure opening shall exclude liquids and contaminants
 - e. Stainless steel door clamp assembly shall assure watertight seal
 - f. Door shall be easily removed by pulling stainless steel continuous hinge pin
 - g. Data pocket shall be high impact thermoplastic
 - h. Hasp and staple for padlocking
 - i. Panel screws shall be stainless steel
 - j. Tapped pads shall be provided for mounting optional panels
- Oil-resistant gasket and adhesive

NEMA TYPE 4X SCREW COVER JUNCTION BOX

NEMA Type 4X Screw Junction Box should be constructed as follows:

- a. Cast aluminum; no welded seams or sharp corners
- b. Captivated cover screws shall be stainless steel
- c. Cover screws shall be placed outside sealed area
- d. Two to four grounding screws shall be located on the enclosure backwall
- e. Oil-resistant and O-ring gasket with tongue and groove construction
- f. Threaded internal bosses shall be provided for mounting optional panels, rails and other components
- g. Mounting holes shall be provided in corners outside of gasketed area
- h. Finish similar to ANSI 61 (RAL 7042) gray paint inside and out
- i. Panel shall be unpainted zinc-plated steel

NEMA TYPE 12 SINGLE DOOR JUNCTION BOX

The NEMA Type 12 single door junction box shall have the following specification:

Construction

- a. Enclosure bodies shall be either 14 gauge or 16 gauge steel. All doors shall be 14 gauge steel.
- b. Seams shall be continuously welded and grounded smooth, no holes or knockouts.

- c. External mounting feet
- d. Door and body stiffeners in larger enclosure
- e. Rolled lip around three sides of door and all sides of enclosure opening shall exclude liquids and contaminants
- f. Door clamps shall be quick and easy to operate.
- g. Door shall be removed by pulling heavy gauge continuous hinge pin
- h. Hasp and staple for padlocking
- i. Data pocket shall be high-impact thermoplastic
- j. Oil-resistant gasket shall be attached with oil-resistant adhesive and shall be held in place with steel retaining strips
- k. Collar studs shall be provided for mounting panels

Finish

- a. White inside with ANSI 61 gray outside finish over phosphatized surfaces. Optional panels shall be white.
- b. Industry Standards:

UL 508 Type 12
 NEMA/EEMAC Type 12
 JIC standard EGP-1-1967 (14 ga. only)
 CSA Type 12
 IEC 529, IP65

NEMA TYPE 12 CONTINUOUS HINGE JUNCTION BOX

The NEMA Type 12 continuous hinge junction box shall have the following specification:

Construction

- a. Enclosure bodies shall be either 14 gauge or 16 gauge steel.
- b. Continuous hinge
- c. External screw clamps shall be quick and easy to operate
- d. Seams continuously welded and grounded smooth, no holes or knockouts.
- e. External mounting feet
- f. Welded nuts shall be provided for mounting optional panels and terminal kits in size 152 X 102 mm and larger
- g. Oil-resistant gasket and adhesive

Finish

- a. ANSI 61 gray polyester powder coating inside and outside finish over phosphatized surfaces. Optional panels shall be white.
- b. Industry Standards:

UL 508 Type 12
 NEMA/EEMAC Type 12
 JIC standard EGP-1-1967 (14 ga. only)
 CSA Type 12
 IEC 529, IP65

FEED THROUGH OUTLET BOX

Feed through outlet box shall be made of cast aluminum with bronze Lektrocote finish for surface mounting. The outlet box shall be 127 mm wide, 19 mm-25.4 mm deep, and 270 mm high and shall have four 12.7 mm tapped hubs and three plugs. (Feed through outlet box shall be used to install 277 V, 42 W compact fluorescent by others).

10-3.08 CABLE TRAYS

Cable trays shall be made of high strength steel wires, ASTM A510, and shall be coated by hot-dipped galvanizing process after fabrication in accordance with ASTM A123. Cable trays shall be designed to support the volume capacity of the cables and shall provide safe mechanical support for spans up to 2.4 meters on center.

Industry Standards: NEMA VE1, IEC 61537, UL Classification.

10-3.09 CONDUIT SUPPORTS

Channel struts shall support all conduits, boxes, and cable trays. At every 1200 mm interval in both side walls of girder box, a vertical piece of channel strut with minimum depth of 82 mm shall be installed. These channels shall be fixed on the

wall by use of embedded anchor and bolt as shown in the plans. Conduits and cable trays shall be secured on the vertical supports by using horizontal channels with minimum depth of 41 mm.

All channel struts and fittings shall be made with hot-dipped galvanized steel and conform to provisions in Section 75-1.03, "Miscellaneous Bridge Metal."

10-3.10 PULL BOXES

Grout shall not be placed in the bottom of new or existing pull boxes.

Pull boxes shown on plan sheet E-49, "Signal and Lighting (City)," shall not have the "CALTRANS" cover marking.

HIGH VOLTAGE PULL BOXES

The high voltage pull boxes shall be a 1524 mm long, 914 mm wide, and 406 mm deep (nominal inside dimensions) that conform to Western Underground Committee Recommended Guide No. 3.6 "Non Concrete Enclosures." Covers for high voltage pull boxes shall be in two sections. Each cover shall be secured with at least four 9-mm stainless steel bolts. Cover markings for high voltage pull boxes should be marked on each cover section. Enclosures and covers shall be concrete gray color. Enclosures may be constructed of reinforced portland cement concrete or any equivalent material which meet the specified load rating. High voltage pull boxes shall be installed as shown on the plans. Enclosures and covers shall have an AASHTO HS 20-44 rating.

TYPE 15 PULL BOXES

Type 15 pull boxes and extensions shall conform to the Western Underground Committee Recommended Guide No. 3.6, "Non-Concrete Enclosures." Type 15 pull boxes shall be 750 mm wide, 1200 mm long, and 460 mm deep (nominal inside dimensions). Each pull box shall have one 200 mm or 400 mm extension. Hold down bolts or cap screws and nuts shall be of brass, stainless steel or other non-corroding metal material. Cover markings shall be "LOW VOLTAGE." Enclosures, covers and extensions shall be concrete gray color.

Type 15 pull boxes shall be installed where shown on the plans for communication system.

10-3.11 CONDUCTORS AND WIRING

Splices shall be insulated by "Method B".

The minimum insulation thickness, at any point, for Type USE, RHH or RHW wire shall be 1.0 mm for conductor sizes No. 14 to No. 10, inclusive, and 1.3 mm for No. 8 to No. 2, inclusive. The minimum insulation thickness, at any point, for Type THW and TW wires shall be 0.69 mm for conductor sizes No. 14 to No. 10, inclusive, 1.02 mm for No. 8, and 1.37 mm for No. 6 to No. 2, inclusive.

Signal cable shall not be used.

10-3.12 BONDING AND GROUNDING

The bonding jumper in standards with handholes and traffic pull box lid cover shall be attached by a 4.5-mm or larger brass bolt and 2 brass washers, and shall be run to the conduit or bonding wire in the adjacent pull box. Standards without handholes shall be bonded by a jumper attached to all anchor bolts, and shall be run to the conduit or bonding wire in the adjacent pull box. The grounding jumper shall be visible after the cap has been placed on foundation.

For equipment grounding purposes in all conduit types, a No. 6 bare copper wire shall be run continuously in circuits used for series lighting, and a No. 8, minimum, bare copper wire shall be run continuously in all other circuits. The bonding wire size shall be increased to match the circuit breaker size, or shall be as shown on the plans. Where Type 3 conduit is to be installed for future conductors, the copper wire may be omitted. Equipment bonding and grounding conductors are not required in conduits which contain only loop lead-in cable or signal interconnect cable or both.

Bonding of metallic conduit in metal pull boxes shall be by means of bonding bushings and bonding jumpers.

10-3.13 SERVICE

Use for all D4 projects with new CB. 3/16/00

Utility confirmation is needed. Usually required when CMS is installed. 3/16/00

Type H service shall consist of a conduit and conductors with length and size as required by the serving utility company.

10-3.14 NUMBERING ELECTRICAL EQUIPMENT

The placement of numbers on electrical equipment will be done by others.

10-3.15 VEHICLE SIGNAL FACES AND SIGNAL HEADS

Lamps for vehicular traffic signal units (yellow sections, green sections and green arrows only) will be State-furnished in conformance with the provisions in "Materials" of these special provisions.

10-3.16 PEDESTRIAN SIGNALS

Lamps for Type A pedestrian signals will be State-furnished in conformance with the provisions in "Materials" of these special provisions.

10-3.17 DETECTORS

Loop detector sensor units will be State-furnished in conformance with the provisions in "Materials" of these special provisions.

Where one detector consists of a sequence of 4 loops in a single lane, the front loop closest to the limit line or crosswalk shall be located 0.3 m from the line. All 4 loops in each lane shall be connected in series.

PREFORMED INDUCTIVE LOOPS

Preformed inductive loops shall be the type shown on the plans.

The loop shall be 1.8 m square unless otherwise shown. The loop shall consist of 4 turns of No. 16, or larger, wire with Type THWN or TFFN insulation.

The loop wires shall be encased in Size 10, minimum, Schedule 40 or Schedule 80 PVC or polypropylene conduit. The conduit shall be sealed to prevent the entrance of water and the movement of wires within the conduit.

The loop wires from the preformed loop to the adjacent pull box shall be twisted together into a pair (at least 7 turns per meter) and encased in Schedule 40 or Schedule 80 PVC or polypropylene conduit between the preformed loop and the adjacent pull box or detector handhole. The lead-in conduit shall be sealed to prevent the entrance of water at the pull box or handhole end.

In new reinforced concrete structure decks, the preformed loops shall be secured to the top of the uppermost layer of reinforcing steel using nylon wire ties. The loop shall be held parallel to the structure deck by using PVC or polypropylene spacers where necessary. Conduit for lead-in conductors shall be placed between the uppermost 2 layers of reinforcing steel.

10-3.18 EMERGENCY VEHICLE DETECTOR SYSTEM

Each traffic signal shall have an emergency vehicle detector system which shall conform to the details shown on the plans and these special provisions.

GENERAL

Each emergency vehicle detector system shall consist of an optical emitter assembly or assemblies located on the appropriate vehicle and an optical detector/discriminator assembly or assemblies located at the traffic signal.

Emitter assemblies are not required for this project except units for testing purposes to demonstrate that the systems perform as specified. Tests shall be conducted in the presence of the Engineer as described below under "System Operation" during the signal test period. The Engineer shall be given a minimum of 2 working days notice prior to performing the tests.

Each system shall permit detection of 2 classes of authorized vehicles. Class I (mass transit) vehicles shall be detected at ranges of up to 300 m from the optical detector. Class II (emergency) vehicles shall be detected at ranges up to 550 m from the optical detector.

Class I signals (those emitted by Class I vehicles) shall be distinguished from Class II signals (those emitted by Class II vehicles) on the basis of the modulation frequency of the light from the respective emitter. The modulation frequency for Class I signal emitters shall be $9.639 \text{ Hz} \pm 0.110 \text{ Hz}$. The modulation frequency for Class II signal emitters shall be $14.035 \text{ Hz} \pm 0.250 \text{ Hz}$.

A system shall establish a priority of Class II vehicle signals over Class I vehicle signals and shall conform to the requirements in Section 25352 of the California Vehicle Code.

EMITTER ASSEMBLY

Each emitter assembly, provided for testing purposes, shall consist of an emitter unit, an emitter control unit, and connecting cables.

General

Each emitter assembly, including lamp, shall operate over an ambient temperature range of -34°C to 60°C at both modulation frequencies and operate continuously at the higher frequency for a minimum of 3000 hours at 25°C ambient before failure of the lamp or other components.

Each emitter unit shall be controlled by a single, maintained-contact switch on the respective emitter control unit. The switch shall be located to be readily accessible to the vehicle driver. The control unit shall contain a pilot light to indicate that the emitter power circuit is energized and shall generate only one modulating code, either that for Class I vehicles or that for Class II vehicles.

Functional

Each emitter unit shall transmit optical energy in one direction only.

The signal from each Class I signal emitter unit shall be detectable at a distance of 300 m when used with a standard optical detection/discriminator assembly and filter to eliminate visible light. Visible light shall be considered eliminated when the output of the emitter unit with the filter is less than an average of 0.0003-candela per energy pulse in the wavelength range of 380 nm to 750 nm when measured at a distance of 3 m. A Certificate of Compliance, conforming to the requirements in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications shall be submitted to the Engineer with each Class I emitter unit.

The signal from each Class II signal emitter unit shall be detectable at a distance of 550 m when used with a standard optical detection/discriminator assembly.

The standard optical detection/discriminator assembly to be used in making the range tests shall be available from the manufacturer of the system. A certified performance report shall be furnished with each assembly.

Electrical

Each emitter assembly shall provide full light output with input voltages of between 12.5 V (dc) and 17.5 V (dc). An emitter assembly shall not be damaged by input voltages up to 7.5 V (dc) above supply voltage. The emitter assembly shall not generate voltage transients, on the input supply, which exceed the supply voltage by more than 4 volts.

Each emitter assembly shall consume not more than 100 W at 17.5 V (dc) and shall have a power input circuit breaker rated at 10 A to 12 A, 12 V (dc).

The design and circuitry of each emitter shall permit its use on vehicles with either negative or positive ground without disassembling or rewiring of the unit.

Mechanical

Each emitter unit shall be housed in a weatherproof corrosion-resistant housing. The housing shall be provided with facilities to permit mounting on various types of vehicles and shall have provision for aligning the emitter unit properly and for locking the emitter unit into this alignment.

Each emitter control unit shall be provided with hardware to permit the unit to be mounted in or on an emergency vehicle or mass transit vehicle. Where required for certain emergency vehicles, the emitter control unit and exposed controls shall be weatherproof.

OPTICAL DETECTION/DISCRIMINATOR ASSEMBLY

General

Each optical detection/discriminator assembly shall consist of one or more optical detectors, connecting cable and a discriminator module.

Each assembly, when used with standard emitters, shall have a range of at least 300 m for Class I signals and 550 m for Class II signals. Standard emitters for both classes of signals shall be available from the manufacturer of the system. Range measurements shall be taken with all range adjustments on the discriminator module set to "maximum".

Optical Detector

Each optical detector shall be a waterproof unit capable of receiving optical energy from two separately aimable directions. The horizontal angle between the 2 directions shall be variable from 180 degrees to 5 degrees.

The reception angle for each photocell assembly shall be a maximum of 8 degrees in all directions about the aiming axis of the assembly. Measurements of reception angle will be taken at a range of 300 m for a Type I emitter and at a range of 550 m for a Type II emitter.

Internal circuitry shall be solid state and electrical power shall be provided by the associated discriminator module.

Each optical detector shall be contained in a housing, which shall include 2 rotatable photocell assemblies, an electronic assembly and a base. The base shall have an opening to permit mounting on a mast arm or a vertical pipe nipple, or suspension from a span wire. The mounting opening shall have female threads for Size 21 conduit. A cable entrance shall be provided which shall have male threads and gasketing to permit a waterproof cable connection. Each detector shall have mass of less than 1.1 kg and shall present a maximum wind load area of 230 cm². The housing shall be provided with weep holes to permit drainage of condensed moisture.

Each optical detector shall be installed, wired and aimed as specified by the manufacturer.

Cable

Optical detector cable (EV-C) shall meet the requirements of IPCEA-S-61-402/NEMA WC 5, Section 7.4, 600-V (ac) control cable, 75°C, Type B, and the following:

- A. The cable shall contain 3 conductors, each of which shall be No. 20 (7 x 28) stranded, tinned copper with low-density polyethylene insulation. Minimum average insulation thickness shall be 0.63-mm. Insulation of individual conductors shall be color coded: 1-yellow, 1-blue, 1-orange.
- B. The shield shall be either tinned copper braid or aluminized polyester film with a nominal 20 percent overlap. Where film is used, a No. 20 (7 x 28) stranded, tinned, bare drain wire shall be placed between the insulated conductors and the shield and in contact with the conductive surface of the shield.
- C. The jacket shall be black polyvinyl chloride with minimum ratings of 600 V (ac) and 80°C and a minimum average thickness of 1.1 mm. The jacket shall be marked as required by IPCEA/NEMA.
- D. The finished outside diameter of the cable shall not exceed 8.9 mm.
- E. The capacitance, as measured between any conductor and the other conductors and the shield, shall not exceed 157 pf per meter at 1000 Hz.
- F. The cable run between each detector and the controller cabinet shall be continuous without splices or shall be spliced only as directed by the detector manufacturer.

Cabinet Wiring

The Model 332 cabinet has provisions for connections between the optical detectors, the discriminator module and the Model 170 controller unit.

Wiring for a Model 332 cabinet shall conform to the following:

- A. Slots 12 and 13 of input file "J" have each been wired to accept a 2-channel module.
- B. Field wiring for the primary detectors, except 24-V (dc) power, shall terminate on either terminal board TB-9 in the controller cabinet or on the rear of input file "J," depending on cabinet configuration. Where TB-9 is used, position assignments shall be as follows:

Position	Assignment
4	Channel A detector input, 1st module (Slot J-12)
5	Channel B detector input, 1st module (Slot J-12)
7	Channel A detector input, 2nd module (Slot J-13)
8	Channel B detector input, 2nd module (Slot J-13)

The 24-V (dc) cabinet power will be available at Position 1 of terminal board TB-1 in the controller cabinet.

Field wiring for the auxiliary detectors shall terminate on terminal board TB-O in the controller cabinet. Position assignments are as follows:

FOR MODULE 1 (J-12)		FOR MODULE 2 (J-13)	
Position	Assignment	Position	Assignment
1	+24V (dc) from (J-12E)	7	+24V (dc) from (J-13E)
2	Detector ground From (J-12K)	8	Detector ground from (J-13K)
3	Channel A auxiliary detector input 1	9	Channel A auxiliary detector input 1
4	Channel A auxiliary detector input 2	10	Channel A auxiliary detector input 2
5	Channel B auxiliary detector input 1	11	Channel B auxiliary detector input 1
6	Channel B auxiliary detector input 2	12	Channel B auxiliary detector input 2

SYSTEM OPERATION

The Contractor shall demonstrate that the components of each system are compatible and will perform satisfactorily as a system. Satisfactory performance shall be determined using the following test procedure during the functional test period:

- A. Each system to be used for testing shall consist of an optical emitter assembly, an optical detector, an optical detector cable and a discriminator module.
- B. The discriminator modules shall be installed in the proper input file slot of the Model 170 controller assembly.

- C. Two tests shall be conducted; one using a Class I signal emitter and a distance of 300 m between the emitter and the detector, the other using a Class II signal emitter and a distance of 550 m between the emitter and the detector. Range adjustments on the module shall be set to "Maximum" for each test.
- D. Each test shall be conducted for a period of one hour, during which the emitter shall be operated for 30 cycles, each consisting of a one minute "on" interval and a one minute "off" interval. During the total test period the emitter signal shall cause the proper response from the Model 170 controller unit during each "on" interval and there shall be no improper operation of either the Model 170 controller unit or the monitor during each "off" interval.

10-3.19 MARNINE NAVIGATIONAL AIDS SYSTEMS

A. RADAR BEACON

The beacon shall provide a precise position indication to mark a safe water channel under the new Benicia-Martinez Bridge. The beacon shall be triggered by vessels' radar pulses and respond by producing a distinctive trace on the radar display of the interrogating vessel.

The beacon shall respond to all radars in its service area, where X- or S-band (X-band: 9320 to 9500 MHz), but shall respond only in the interrogated band. The beacon response to interrogation shall be the transmission of a preselected Morse-coded microwave signal. The code for this signal and the trace length shall be settable as determined by the U.S. Coast guard. The beacon shall be omnidirectional. The beacon shall provide a range of 15 nautical miles, minimum for line of sight transmission. The beacon shall respond to the main lobe of the interrogating radar beam. The beacon shall sample the interrogating radar signal based on impulse width and frequency in order to provide sidelobe suppression while servicing and responding to all interrogations. The beacon shall incorporate circuitry which shall provide the equivalent of a closure of a normally open contact to indicate when the beacon is not operating. The beacon shall be equipped with the following remote control capabilities:

1. Changing reply codes
2. Turning itself on and off
3. Providing detailed self-test reports on demand
4. Altering marine radar band service intervals for emergencies on special situations

The input voltage to beacon shall be 12 volts DC nominal. The beacon shall be operable throughout the range of DC input voltage from minimum 10 volts to maximum 18 volts. The beacon shall be mounted in a pressurized gas tight, weatherproof enclosure. The beacon shall have lighting, surge, and reverse polarity protection. The connection of conductors to the beacon and functional testing of the beacon shall be done under the supervision of the beacon manufacturer. The Contractor shall submit a certificate of compliance in accordance to Section 6-1.07, "Certificates of Compliance," of the Standard Specifications which shall indicate that the beacon was approved by the FCC and the U.S. Coast Guard.

B. TRAINING FOR RADAR BEACON SYSTEM

Prior to acceptance of the contract, a trained representative of the beacon manufacturer shall demonstrate the proper operation of the beacon.

After the radar beacon system is in operation, the contractor shall provide an instructional video tape, complete written instruction, and a demonstration for the State Maintenance personnel for radar beacon system. The instruction shall include the general theory of the operation, and equipment maintenance, including troubleshooting procedures with complete wiring diagrams and circuit schematics.

C. BATTERY

The batteries shall be 12 volts nominal, maintenance free, lead-calcium, photovoltaic, and rechargeable units with low self-discharge rate. The amp-hour ratings for each particular navigational aids system shall be as shown on plans. The battery of each particular system shall be housed in a weatherproof fiberglass enclosure with a hinged lid and stainless steel hardware and sized as shown on plans.

D. CHARGER

The charger shall be a pulse-width modulated voltage regulator that automatically maintain full charge on the 12 volts or 14 volts battery without overcharging according to the battery manufacturer's specifications. In addition, the charger shall have the following features:

1. Rated operating temperature between -40 and +85°C.
2. Electronic interrupt functions to protect against short-circuits, and reverse polarity.
3. Transient voltage suppressor rated for 1500 W.

E. LANTERNS

Each lantern shall have 12 degree vertical divergence of the light beam with a single piece lens of Acrylic Fresnel with a bird spike. Lens colors shall be as specified on plans. The lens shall be secured to the base through a hinge and with a minimum of three point fasteners. The base shall be corrosion resistant, ultra-violet radiation resistant and waterproof. The base shall be made of either reinforced polyester compression molded fiberglass or polycarbonated plastic. Each lantern shall be fitted with a four place automatic lamp changer. Each lantern shall have a visibility range of 1600 meter at nighttime and shall be equipped with an integral photo cell for turn on and turn off.

F. FLASHING BEACONS

Beacons shall have the same specifications as the lanterns except for the following:

1. They shall be fitted with a four place automatic lamp flashchanger.
2. They shall be controlled by a radio transmitter and receiver instead of a photo cell.
3. The flash rate shall be 2 seconds on and 1 second off with 10 percent margin of error.

G. FLASHING BEACON CONTROL TRANSMITTER AND RECEIVER

The transmitter and receiver shall employ frequency-hopping pattern using 240 narrow-band channels within the Radio Frequency (RF) spectrum and shall be able to operate within 600 meter apart. The radios shall operate in the frequency range of 902.0 to 928.0 MHz and shall be developed for license-free.

The control board shall be a microprocessor-based unit that shall have a multiple of inputs and outputs channels. All boards shall be equipped with an RS-232 output for future use. The control board shall be conformal coated and shall have an operating temperature range of -40 to +60°C.

RADIO SPECIFICATIONS FOR TRANSMITTER	
Minimum RF output	50 mW
Typical RF output	100 mW
Out of Band Spurious Radiation	1 kHz Bandwidth
Modulation Bandwidth	Meet FCC Part 15.247
Operating input voltage	120 VAC

RADIO SPECIFICATIONS FOR RECEIVER	
Channels	240, 25 kHz Wide
Channel spacing	100 kHz
Operating input voltage	12 VDC (solar power)

H. FOG SIGNAL

The siren shall be heard omnidirectional within 2640 meter. The siren frequency shall be 500 Hz of electromechanical sound wave. The programmable sound pattern shall meet the requirement of the U.S. Coast Guard for such marine warning device on the new bridge. The siren shall be automatically controlled by the fog detector, a single station, backscatter device using modulated infrared light to monitor visibility over three thresholds in the range of 0.8 to 6.4 km.

Detector Specifications

1. Approximate 2 to 12 meter sampling zones
2. Sampling time of 12 seconds every 2 minutes
3. 0.94 μ m light wavelength
4. 16 kHz pulse frequency
5. -25 to +70°C operating temperature
6. 11 to 30 VDC supply voltage
7. No volt-output contact

8. Dimension: 312 mm x 480 mm x 633 mm
9. Net weight: 12 kg

I. SOLAR MODULES

Photovoltaic modules shall be configured with solar cells to charge 12 V batteries and suitable for use in the harsh marine environment. Type 55 module shall have the following specifications:

Cells	Single crystal silicon
Cell coating	Textured antireflective
Laminate	Ethylene vinyl acetate
Cover	Tempered glass
Frame	Anodized aluminum
Output cable	2 No. 18 polyethylene jacketed
Output power	55 W
Weight	5.5 kg
Size	1293 mm x 330 mm x 36 mm
Operating temperature	-40 to +90°C
Wind load	200 km

Type 30 module shall have the following specifications:

Cells	Semocrystalline silicon
Laminate	Ethylene vinyl acetate
Cover	Tempered glass
Frame	Extruded aluminum
Output cable	2 No. 18 polyethylene jacketed
Size	592 mm x 501 mm x 50 mm
Output power	30 W
Operating temperature	-40 to +90°C
Wind load	200 km

J. SOW CABLE

The cable shall be 3 No. 10 AWG of stranded flexible copper conductors rated at 600 V. The cable shall have water resistant neoprene jacket which shall provide resistance to oils, ozone, abrasion, shall withstand temperatures ranged -35 to +90°C, and meet MSHA (Mine Safety and Health Act) requirement tests.

10-3.20 HEALTH MONITORING SYSTEM (SHIPPING CHANNEL SPAN)

SCOPE

This work shall consist of the work of furnishing, installing, maintaining the structure health monitoring system (shipping channel span), during construction, in accordance with the details shown on the plans, these special provisions, and as directed by the Engineer. The shipping channel health monitoring system is intended to monitor the behavior of portions of the structure both during and after construction, to validate the predicted behavior of the structure, and the validate the design assumptions related to time-dependent behavior, material properties and temperature effects. The schedule for installing the shipping channel span health monitoring is dependent upon the Contractor's construction schedule.

PREDESIGN MEETING

Prior to submitting any working drawings for the shipping channel span health monitoring, the Contractor shall meet with the Engineer, and the State's University of California contact to develop an understanding of the goals shipping channel span health monitoring and the basis of the bridge design. The Contractor shall be responsible for scheduling and arranging the meeting to be held at the Resident Engineer's Office. The Contractor shall be prepared to discuss any proposed changes or substitutions to the specified health monitoring instrumentation at the meeting.

INSTRUMENTS

Contractor shall install instrumentation as summarized on Table 1 on the "Health Monitoring System (Shipping Channel Span)" sheet and as defined in these special provisions.

TYPES OF MEASUREMENTS

Deflection-- Long-term deflections in Span 7 shall be measured using a base-line system attached to the underside of the deck as close as possible to the longitudinal center line of the box girder. The system shall consist of a No. 8 stainless steel piano wire as a reference line, two end brackets at the live and dead ends, base plates, and a caliper. The dead end and live end brackets shall be anchored to the underside of the deck with expansion anchor bolts as close as possible to the diaphragms at Piers 8 and 7, respectively. The piano wire shall be anchored to the bracket at the dead end and shall pass over a pulley at the live end. The wire shall be stressed to approximately 80 percent of its breaking strength using dead weights at the live end. The wire shall be coated with linseed oil to resist corrosion.

Deflections shall be measured manually at midspan and at the one fifth points. At each deflection location, a true horizontal reference steel plate shall be attached to the concrete using expansion anchor bolts. The distance between each base plate and the piano wire shall be measured using a digital caliper with a magnetic base. The Contractor may propose an automated measuring system for taking deflection measurements from the piano wire, provided it is shown to be as accurate as the digital caliper manual measuring system.

The base-line system shall be installed as soon as possible after the midspan closure of Span 7 is complete. In order to relate the base-line deflection readings to prior surveys performed during construction, a tie-in optical survey shall be performed simultaneously with at least one set of base-line system readings.

As an alternate to the piano wire system requiring manual readings, a system of interconnected liquid levels, monitored with precision vibrating wire level sensors, and capable of automatically reporting accurate differential deflections to the automatic data acquisition system (ADAS system) may be proposed.

Length Change-- Longitudinal length changes in Spans 7 and 8 of Frame 3 shall be measured using extensometers. Each extensometer shall consist of a 6-mm (1/4-in.) diameter graphite rod with a low coefficient of thermal expansion inserted into an 18-mm (3/4-in.) diameter PVC pipe attached to the underside of the girder top slab. One end of the graphite rod shall be fixed to the concrete deck close to one diaphragm. The other end shall be attached to a linear variable displacement transducer (LVDT) attached to the concrete deck near the other diaphragm. The LVDTs shall have ranges of at least 75 and 150 mm (3 and 6 in.) for Spans 8 and 7, respectively. The system shall be installed along the longitudinal center line of the box girder as soon as possible after the midspan closures are complete. The LVDTs shall be connected to the ADAS.

Strain-- Strains shall be measured using vibrating wire strain gages (VWSG) Model VCE-4200 by Geokon, Incorporated, or Model EM-5 by Roctest, Inc. Vibrating wire strain gages shall be equipped with thermistors for measurement of temperature at the gage location. Gages shall be supplied by the manufacturer with sufficient lead wire to reach from gage location to ADAS without additional splicing of lead wire.

VWSGs shall be supported prior to concrete placement such that they are held in position during concrete placement but not restrained from any longitudinal length change. Gages shall be connected to the ADAS prior to concrete placement and for up to three days after concrete placement. For removal of formwork, gages may be disconnected from the ADAS but shall be reconnected to the final system as soon as possible thereafter. Manual readings may be taken when the gages are not connected to the ADAS.

Rotation-- Rotations shall be measured using Model 800-H tiltmeters with high-gain option by Applied Geomechanics, Incorporated. Tiltmeters shall be supplied by the manufacturer with sufficient lead wire to reach from gage location to data acquisition unit without additional splicing of lead wire. Contractor shall supply mounting plates for installing two tiltmeters in a horizontal or vertical position on sloping walls of the box girder. Tiltmeters at Locations B and D shall be installed and connected to the ADAS prior to completion of closure pour in Span 7. Tiltmeter at Location E shall be installed as soon as possible after the footing is cast and shall be connected to the ADAS prior to completion of closure pour in Span 7.

Concrete Temperature-- Concrete temperatures shall be measured using Copper-Constantan Type T thermocouples with a temperature range of -46°C to 121°C. Thermocouple ends shall be protected from corrosion by the concrete. Thermocouples shall be installed prior to concrete placement and shall be held rigidly in place during concrete placement to prevent movement from their intended locations.

Thermocouples shall be connected to the automated data acquisition system prior to concrete placement and for up to three days after concrete placement. For removal of formwork, thermocouples may be disconnected from the ADAS but shall be reconnected to the final system as soon as possible thereafter.

Ambient Temperature-- Air temperatures outside and inside the box girder shall be measured using Copper-Constantan Type T thermocouples with a temperature range of -46°C to 121°C. Thermocouples shall be connected to the automated data acquisition system prior to concrete placement and for up to three days after concrete placement. For removal of formwork, thermocouples may be disconnected from the ADAS but shall be reconnected to the final system as soon as possible thereafter.

Relative Humidity-- Relative humidity shall be measured at two locations using Model HMP 45A by Vaisala, Inc. or Model HMP 45C by Campbell Scientific, Inc. One meter shall be located inside the box girder of Span 7. The other meter shall be placed outside the box girder near Pier 7 to measure external humidity. It shall be protected from the direct influence of the sun and rain and be located in the permanent shadow of the box girder. The humidity meters shall be installed as soon as possible after construction of the pier segment at Pier 7 and shall be connected to the ADAS as soon as possible thereafter.

Prestressing Force-- Forces in two span-tendons in Span 7 shall be measured with center hole load cells, having a capacity of at least 3000 kN. Load cells shall be installed around the strand prior to post-tensioning and shall be located between the anchor plates for the wedges and the concrete build-out for the anchor plate bearing. Load cells shall have a maximum non-linearity of one percent over their load range. Load cells shall be connected to the ADAS prior to stressing the instrumented tendons. Tendons with the load cells shall not be grouted. Attention is directed to "Prestressing Concrete" of these special provisions.

Hinge Force-- Load Cells for the measurement of hinge forces are incorporated in the Hinge C and D bearings (Type I). At hinge D in Span 8, four bearings per steel box girder, 8 total, shall be connected to the data collection system. The instrument installer is required to coordinate with the bearing manufacturer to the extent that he is aware of the output characteristics of the hinge bearing load cells and is prepared to collect the data from them. The instrument installer is responsible for connecting the load cells to the ADAS and monitoring them. Attention is directed to "Hinge C and D Bearings" of these special provisions.

Wire Break Detection--Condition of the post-tensioning tendons shall be continuously monitored to detect and record failures of individual wires. Wire breaks will be detected using surface mounted broad band accelerometers Model SPZD-192 manufactured by Pure Technologies Limited. A total of 90 sensors will be mounted on the underside of the deck span after removal of the formwork. Sensors will be connected to the SoundPrint® data acquisition system provided by Pure Technologies Ltd.

Corrosion, Epoxy Coated Reinforcement--The potential for corrosion of reinforcement shall be measured using rebar probe assemblies Model CP-REB-SW with reference electrode by Electrochemical Devices, Inc. or equivalent. Probes and reference electrode shall be supplied by the manufacturer with sufficient lead wire to reach from the sensor locations to the ADAS without additional splicing of lead wire. Lead wires may be cast into the concrete or externally mounted. External lead wires shall be protected in conduit.

Eight probes with reference electrodes shall be placed at Piers 7 and 8 for a total of 16 pairs. At each pier, four pair shall be placed in the footing at mean sea level and four pair in the pier shaft not more than 1 m above the top of the footing. Sensors shall be attached to the layer of reinforcement closest to the surface in accordance with manufacturer's instructions. Sensors shall be connected to the ADAS as soon as possible. Manual readings may be taken when the gages are not connected to the ADAS.

Corrosion, Steel Pile Casings--The potential for corrosion of the steel pile casings shall be measured using immersion reference electrodes Model IR-AGG by Electrochemical Devices, Inc. or equivalent. Electrodes shall be supplied by the manufacturer with sufficient lead wire to reach from the electrode location to the ADAS without additional splicing of lead wire.

Four sensors shall be placed on four different steel pile casings at each of Piers 7 and 8 for a total of eight sensors. The sensors shall be installed in accordance with the manufacturer's recommendations on the outside of the casing within 1 m of the underside of the footing.

Sensors shall be connected to the ADAS as soon as possible. Manual readings may be taken when the gages are not connected to the ADAS.

Survey Monuments-- Three permanent corrosion resistant monuments shall be installed on top of each footing for assessment of horizontal and vertical movements and rotations. The monuments shall be installed and their elevations and positions determined before construction of the pier shafts. Installation shall be in accordance with "Survey Monuments" elsewhere in these special provisions. After installation, the monuments shall be surveyed by a Land Surveyor, who is registered in the State of California. Survey notes with the locations and elevations of the new monuments shall be submitted

to the State within 2 weeks of each completed survey. These are separate from, and additional to, the monuments required in "Survey Monuments" of these special provisions.

EQUIPMENT FOR MONITORING

Cabling—The Contractor shall provide all cabling per manufacturers' recommendations to connect sensors to the ADAS. All cabling for VWGs and thermocouples shall be adequately secured to the undersides of steel reinforcement using plastic ties and routed to the location of the ADAS. The Contractor may route cables through plastic conduit with permission of the Engineer. Where all cabling exits from concrete, it shall be installed in conduit. Cabling not cast in concrete shall be adequately secured to the deck or walls of the box girder. Cabling shall not remain on the bottom slab of the box girder. The Contractor shall be responsible for protection of all cabling from damage until acceptance by the Engineer.

Automatic Data Acquisition System (ADAS)—The Contractor shall supply an ADAS capable of monitoring all electronic sensors. During concrete placement, the ADAS shall have the capability of monitoring all thermocouples and all vibrating wire strain gages at one cross section. The Contractor may use different systems during concrete placement and for subsequent monitoring. Manual readings will be permitted between the use of each system.

The automatic data acquisition system shall have the following scanning capabilities:

1. For thermocouples and vibrating wire gages cast in fresh concrete—15 minute intervals adjustable for up to 3 day intervals.
2. Single channel monitoring—every second.
3. With all instrumentation connected—every 30 minutes, intervals adjustable for up to one month periods.

All data shall be stored in memory during scanning and stored on disc after each scan unless loaded to another backup system. All data shall be stored in calibrated engineering units.

The ADAS shall be capable of the following:

1. Automatic calculation of engineering units from measured units including temperature corrections
2. Automatic calculation of changes in engineering units from a previous set of readings
3. Visual display of data showing plots of one measured item versus another
4. Automatic scanning of all channels at selected time intervals
5. Repeated scanning of selected channels on command
6. Scanning of a single channel at one second intervals
7. Hard copy printout of data and plots
8. Transfer data to a remote location
9. Receive instructions and modifications to instructions from a remote location
10. Self checking in the event of power failures

The ADAS shall be protected from mechanical, electrical, and environmental damage. The Contractor shall be responsible for protection, safety, repair, and maintenance of the ADAS until accepted by the Engineer.

The Contractor shall supply manual readout equipment for all sensors.

Acoustic Monitoring Data Acquisition System—The SoundPrint® data acquisition system (DAS) shall perform the following functions:

1. It shall function as a management system for data collection, storage, processing and transmission of acoustic data.
2. The software installed on the PC shall be able to analyze acoustic events to filter out spurious events. It shall be designed to provide graphical representations of sensor outputs in frequency and time domain.
3. The PC shall be equipped with a modem capable of transmitting the data to a remote PC. One remote PC shall be located at a location to be specified by the Engineer and another shall be located at the office of the company that designed the acoustic monitoring system. The PC at the bridge site shall be equipped with an automatic dial-up data transmission function with time or event frequency parameters. The remote PC at the location to be specified by the Engineer shall be equipped with software that graphically presents the transmitted data and will facilitate generation of reports. The sensor response can be displayed in time domain, frequency spectrum or power domain.
4. The DAS will have remote diagnostic capabilities.
5. Information-on-demand reporting functions will be available to the owner over the Internet.
6. The Acoustic Monitoring System shall be designed and supplied by Pure Technologies Ltd.

* Pure Technologies Ltd. can supply the ADAS as described in "Automatic Data Acquisition System" incorporated within the existing SoundPrint® data acquisition system. Modification to the SoundPrint® software and hardware would be required to record the various outputs of the instrumentation considered for this project.

ALTERNATIVE INSTRUMENTATION

The Contractor may propose alternative instrumentation to meet the goals stated in the technical memorandum available as a "Materials Handout". The Material Handout will be made available at the office Department of Transportation, Plans and Bid Documents, Room 0200, Transportation Building, 1120 N Street, P.O. Box 942874, Sacramento, California 94274-0001, Telephone No. (916) 654-4490. Such proposals shall contain information that the proposed instrumentation has a proven reliability, sensitivity, and accuracy at least equal to that of the specified instrumentation. Use of alternative instrumentation shall be subject to approval by the Engineer.

The Contractor may install redundant instrumentation at no cost to the State to increase reliability of successful installation of the instruments.

SUBMITTALS

The Contractor shall submit working drawings for the Instrumentation Plan and ADAS to the Resident Engineer's Office at 757 Arnold Drive, Suite 200 Martinez, California 94553 at telephone number (925) 646-1996, for approval in accordance with the provisions in Section 5-1.02, "Plans and Working Drawings". For initial review, 10 sets shall be submitted. The instrumentation plan shall be prepared under the supervision of and sealed by a professional engineer licensed in the State of California, with experience in bridge design and instrumentation. After review, between 6 and 12 sets, as requested by the Engineer, shall be submitted to said Office for final approval and for use during construction. The review time to be provided for the Engineer's review of the Contractor's working drawings shall be 6 weeks after complete submittals are received. The Contractor shall be responsible for submitting working drawings sufficiently early so that the data collection during construction is not delayed.

Instrumentation Plan—The Contractor shall submit a detailed Instrumentation Plan at least two months before the first instrumentation is to be installed. The instrumentation plan shall include the following for each type of measurement:

1. Manufacturer's name, model number, and technical literature for each sensor
2. Planned location for each sensor
3. Method to be used to locate sensor at planned location (with shop drawings, if appropriate). Provisions for attaching the sensor to eliminate dislodgement or damage during concreting will be specifically addressed.
4. Identification system for each sensor
5. Planned routing of wires to ADAS
- 6.

For the ADAS, the following shall be included:

1. Manufacturer's name, model number, and technical literature
2. Number and type of channels available
3. Scanning and programming options
4. Schematic layout of instrumentation and cabling
5. Methods for remote access to download data
6. Data reduction software
7. Backup plans in the event of system failure
8. Methods to protect system from mechanical, electrical, and environmental damage
- 9.

APPROVAL OF ENGINEER

No instrumentation shall be installed until the detailed Instrumentation Plan is approved by the Engineer.

INSTALLATION

Installer Qualifications—The Contractor shall retain a subcontractor with expertise in instrumentation of civil engineering structures. The subcontractor shall have successfully completed at least three projects and shall have at least five years of demonstrated experience at successfully installing instrumentation and data acquisition systems similar to that required on this project. The lead employee on site shall have successfully completed at least two projects and shall have at least five years of demonstrated experience at successfully installing instrumentation and data acquisition systems similar to that required on this project.

Pure Technologies, Inc., the manufacturer and supplier of SoundPrint® data acquisition system, is the only supplier of this type of device that is known to the State. The Acoustic Monitoring Data Acquisition System shall be purchased from:

Pure Technologies, Ltd.
1050, 340 –12 Ave. S.W.
Calgary, Alberta T2R 1L5
(800) 537-2806 or (403)266-6794

Pure Technologies, Ltd. has agreed to furnish the SoundPrint® data acquisition system, the surface mounted broad band accelerometers and other equipment and services described in these special provisions at the guaranteed prices as follows:

Item	Price
SoundPrint® data acquisition system, the surface mounted broad band accelerometers and other required equipment	\$129,800

The above prices include sales tax and delivery of materials to the job site, and will be guaranteed to any bidder ordering such materials and services prior to December 31, 2004, provided delivery is accepted within 90 days after the order is placed.

Other equipment and services to be provided by Pure Technologies, Ltd., included in the above prices, are as follows:

1. Technical advice and direction during startup and installation of the system
2. Mobilization of two site engineers for a total of 15 days including round trip airfare, hotel, rental car, travel time and expenses.
3. Installation and commissioning of all sensors and cabling
4. Onsite system testing and commissioning after installation.
5. One week of training in data collection and interpretation of the data for the Contractor and the State's representatives will be provided at the location of the remote computer (in California).

The Contractor shall furnish all materials, equipment, and labor necessary to obtain an operating strand breakage system in addition to that which is supplied by the manufacturer of the SoundPrint® data acquisition system and the surface mounted broad band accelerometers. This includes the following:

1. The Contractor shall furnish 110-volt power supply and a telephone line to the acquisition unit and 110-volt power supply to a total of three marker box locations.
2. The Contractor shall furnish and install all conduit required from the acquisition unit to the accelerometers and/or marker boxes. The assumed location of the acquisition unit is inside the box section at Pier 8. It is estimated that approximately 6400m of 50mm diameter conduit is required. The conduit shall be either surface mounted or embedded type. Electrical junction boxes, where required shall be 150mm by 150mm.
3. Equipment and labor sufficient to provide Pure Technologies, Ltd. staff access to the underside of the slab (both inside the box and on the overhangs) during installation of the acoustic sensors and cable installation.
4. Contractor shall provide one laborer to assist with installation as needed by Pure Technologies, Ltd. installation staff.

Preplacement Conference.—At least two months prior to the placement of the first instruments on the project, a mandatory preplacement conference shall be held with the Contractor, the instrumentation supplier and installer, the Engineer, the State's inspectors and any other parties involved with the shipping channel span health monitoring. The Contractor shall present his plans for furnishing, installing, testing and monitoring the instrumentation, in accordance with the requirements of these special provisions.

Tolerances--The planned location of each sensor will be defined in the Instrumentation Plan. The Contractor shall make every effort to locate the sensor at the planned location. However, it is recognized that interferences may occur. The Contractor shall, therefore, measure the exact location of each sensor after installation. The sensor location shall be defined longitudinally, laterally, and vertically relative to easily identified locations in the finished structure. For concrete strain gauges orientation is also important, gauges must be placed parallel to the surfaces of the element containing them and parallel to the longitudinal axis of the box girder. If this is difficult to verify visually, measurements shall be made to assure parallel orientation within 2 degrees.

Inspection and Approval--The Contractor shall demonstrate that all thermocouples and vibrating wire strain gages have been installed, locations documented, sensors connected to the ADAS, and the system is functioning correctly prior to placement of concrete at locations containing thermocouples and vibrating wire strain gages.

Submittals

The Contractor shall submit the Instrumentation Installation Final Report to the Resident Engineer's Office 757 Arnold Drive, Suite 200 Martinez, California 94553 at telephone number (925) 646-1996, for approval in accordance with the provisions in Section 5-1.02, "Plans and Working Drawings". Instrumentation Installation Progress Reports shall be submitted to and reviewed by the Resident Bridge Engineer. For initial review, 5 sets of each type of report shall be submitted. Incomplete Instrumentation Installation Progress Reports and Instrumentation Installation Final Report will be returned unreviewed if all information is not included. If a Progress Report is not rejected within 7 days of its receipt, it shall be deemed to be accepted. The review time to be provided for the Engineer's review of the Contractor's Final Report shall be 6 weeks after a complete submittal is received.

Instrumentation Installation Progress Reports--Within 3 working days following installation of a set of instrumentation and final connection to the ADAS, Contractor shall supply an Instrumentation Installation Progress Report. The report shall contain the following:

1. Manufacturer's name and model number for each sensor
2. Measured location of each sensor including as-built drawings
3. Identification number of each sensor
4. Channel number of each sensor on the ADAS
5. Description of methods used to install sensors
6. Data reduction procedures
7. Calibration factor of each sensor
8. Working Status and reliability for each sensor.
9. Listing of problems encountered and the method employed to resolve them.

Instrumentation Installation Final Report--Within one month following installation of the last instrumentation and connection to the ADAS, the Contractor shall supply an Instrumentation Installation Final Report. The report shall contain the following:

1. Manufacturer's name and model number of all major components of the ADAS
2. Complete listing of each sensor and channel number on the ADAS
3. Current working status and reliability of each sensor
4. Operator's manual for the ADAS
5. Listing of problems encountered and methods of solution
6. Recommended changes or improvements to the system

MONITORING

Initiation, Duration, and Completion of Construction Monitoring—The Contractor shall install instrumentation according to the schedule shown in Table 1, "Installation Schedule," below.

With the exception of the thermocouples for measurement of concrete temperature, all instrumentation furnished by the Contractor shall have a design life of at least 25 years. The thermocouples shall have a design life of up to five years after installation.

During construction and prior to acceptance by the Engineer, the Contractor shall be responsible for installation, maintenance, and repair of the instrumentation system. Prior to completion of the project and after acceptance of the Instrumentation Installation Final Report by the Engineer, the Contractor shall transfer responsibility of a fully operational system to the State or its representative. The Contractor shall cooperate with the Engineer to ensure a smooth transition and to ensure that the subsequent operator of the system has a thorough knowledge of its operation. All original equipment and user manuals for the sensors and ADAS will be included in the material given to the Engineer. Any additional instructions needed for operation of the installed system will also be prepared by the installer and included in the material given to the Engineer.

Intervals--See ADAS capabilities elsewhere in these special provisions. The Engineer or his designated representative shall be permitted more frequent scanning during specific construction operations and less frequent scanning during long-term monitoring.

Readings of the baseline-system shall be taken at daily intervals for the first week following installation of the system. Thereafter, readings shall be taken at weekly intervals for the first month, monthly for the first year, and thereafter, at three-month intervals.

Submittals—The Contractor shall submit all data in engineering units in the form of an electronic file to the Engineer on a monthly basis and at other times as requested by the Engineer. Hard copies of the graphed data shall also be supplied. The data shall include readings taken manually as well as those recorded by the ADAS. The data shall be in an Excel or Access file and shall clearly identify date and time of reading, sensor identification, engineering units, and reference set of data (zero reading). The data shall also identify any readings that have questionable accuracy together with an explanation. The Contractor shall submit data as listed above to Resident Engineer's Office 757 Arnold Drive, Suite 200 Martinez, California 94553 at telephone number (925) 646-1996, for approval in accordance with the provisions in Section 5-1.02, "Plans and Working Drawings". For initial review, 5 sets shall be submitted. The review time to be provided for the Engineer's review of the data shall be 6 weeks after data is received.

MATERIALS TESTING

In addition to the materials testing for quality control, Contractor shall conduct material tests of concrete used in Locations A through D, as shown on the plans.

Laboratory Qualifications--Tests shall be conducted by a testing laboratory approved by the Engineer and with previous experience in testing concrete for modulus of elasticity, coefficient of thermal expansion, creep, and shrinkage.

Personnel Qualifications--Testing shall be performed under the supervision of a California Licensed Professional or Structural Engineer with at least five years experience in supervising tests for modulus of elasticity, coefficient of thermal expansion, creep, and shrinkage. Testing shall be conducted by personnel certified in accordance with ACI Concrete Laboratory Testing Technician, ACI Concrete Strength Testing Technician, requirements of ASTM C 1077.

Approval of Engineer--At least two months prior to casting concrete at the first instrumented location, the Contractor shall submit qualifications of the proposed testing laboratory for approval by the Engineer. No testing shall be permitted until the Engineer has approved the testing laboratory.

Testing Program--The Contractor shall conduct a materials testing program in accordance with Table 2, "Concrete Materials Testing Program," below. All specimens shall be 152x305mm concrete cylinders cast from concrete representative of that used at the instrumented locations. All specimens except those tested at three days shall be cured in the molds under similar temperatures as the box girder concrete. Specimens shall be stripped when formwork at the corresponding instrumented section is stripped. Thereafter specimens shall be stored on site protected from direct rain and sunlight until they are required to be moved for testing.

Specimens to be tested at three days shall be cured in the molds under similar temperature conditions as the box girder concrete for as long as possible but at least for 24 hours. Specimens shall be stripped on the day of testing. Shrinkage measurements shall begin as soon as possible after specimens are stripped.

The following testing procedures shall be used:

Compressive Strength:	AASHTO T23
Modulus of Elasticity:	ASTM C 469
Coefficient of Thermal Expansion:	Corps of Engineers ORD C-39
Creep and Shrinkage	ASTM C 512

Creep and shrinkage specimens shall be stored under standard curing conditions. Creep and shrinkage tests (12 sets total) shall continue for one year. Six sets of creep and shrinkage tests shall continue for five years. Readings after one year shall be taken every three months.

Submittals-- Test reports for compressive strength, modulus of elasticity, and coefficient of thermal expansion shall be submitted to the Engineer within 48 hours of the test being completed. Test reports on creep and shrinkage shall be submitted at monthly intervals for the first year and quarterly, thereafter.

The Contractor shall submit test reports to the Resident Engineer's Office 757 Arnold Drive, Suite 200 Martinez, California 94553 at telephone number (925) 646-1996, for approval in accordance with the provisions in Section 5-1.02, "Plans and Working Drawings". For initial review, 5 sets shall be submitted.

Table 1 Installation Schedule

Measurement Type	Sensor	Installation
Deflection	Base-line system	After midspan closure of Span 7
Length Change	LVDT	After midspan closures of Span 7 and Span 8
Strain	VWSG	Before concrete placement
Rotation at Locations B and D	Tiltmeter	Before midspan closure of Span 7
Rotation at Location E	Tiltmeter	After footing concrete is placed
Concrete Temperature	Thermocouple	Before concrete placement
Air Temperature	Thermocouple	Before concrete placement
Relative Humidity	Humidity Meters	After casting pier segment at Pier 7
Prestressing Force	Load Cell	During tendon installation
Hinge Force	Load Cell	During hinge installation
Wire Break Detection		After midspan closure of Span 7
Corrosion - Reinforcement	Reference Cells	Before concrete placement
Corrosion - Steel Pile Casings	Reference Cells	After footing concrete is placed
Survey Monuments		After footing concrete is placed

Table 2 Concrete Materials Testing Program

Material Property	Number of tests at Each Age, Days						Total Specimens
	3	7	28	56	91	180	
Compressive Strength 18 cylinders from each of 4 locations	12	12	12	12	12	12	72
Modulus of Elasticity 18 cylinders from each of 4 locations	12	12	12	12	12	12	72 ^(NOTE 1)
Coefficient of Thermal Expansion 3 cylinders from each of 4 locations	12		12			12	12
Creep and Shrinkage 12 cylinders from each of 4 locations							
Creep	8		8			8	24
Shrinkage	8		8			8	24

NOTES:

1. Same specimens as compressive strength.
2. Total number of cylinders is 33 per instrumentation locations. Locations are A, B, C, and D as identified on the "Health Monitoring System (Shipping Channel Span)" sheet.

10-3.21 REMOVING, REINSTALLING OR SALVAGING ELECTRICAL EQUIPMENT

Salvaged electrical materials shall be hauled to Contra Costa County, Traffic Signal Shop, 2467 Waterbird Way, Martinez, CA 94533, (925)-313-7054 and stockpiled.

The Contractor shall provide the equipment, as necessary, to safely unload and stockpile the material. A minimum of 2 working days' notice shall be given prior to delivery.

10-3.22 PAYMENT

The contract lump sum price or prices paid for signal and lighting shall include highway lighting at intersections in connection with signals only.

Other roadway lighting on the project shall be considered as included in the contract lump sum price paid for traffic operations system.

Full compensation for hauling and stockpiling electrical materials shall be considered as included in the contract price paid for the item requiring the material to be salvaged and no additional compensation will be allowed therefor.

The contract lump sum price paid for the following items shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing said item, complete in place, including all the foundations, poles, manuals and testing, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer:

- Traffic operations system
- Electrical Facilities 1
- Electrical Facilities 2
- Electrical Facilities 3
- Electrical Facilities 4
- Electrical Facilities 5
- Electrical Facilities 6
- Electrical Facilities 7
- Electrical Facilities 8
- Electrical Facilities 9
- Pier 3 Substation Conduit Layout
- Conduit Layout in Piers 6 thru 8
- Conduit Layout in Piers 9 thru 15
- Pier 3 Substation Grounding Layout
- Marine navigational aids system

The contract lump sum price paid for health monitoring system (shipping channel span) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in designing, furnishing, installing, and monitoring the health monitoring system (shipping channel span), complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer. Partial payments on this lump sum item shall be made in accordance with the following:

Instruments--Partial payments for sensors, cabling, and ADAS may be made for the invoice price plus freight and taxes, after delivery to approved storage at the bridge site. Total payment shall not exceed the total cost for the instruments.

Installation--Partial payments for installation of sensors may be made after sensors are installed, final connections made to the ADAS, and the corresponding Instrumentation Installation Progress Report accepted. Payment shall be based on prorating number of sensors successfully installed to the total number of sensors stated in the Instrumentation Plan. Payment shall not be made for installation of sensors that are not functioning when the Progress Report is accepted.

Monitoring--Partial payments for monitoring the system may be made on a quarterly basis provided the system is operating correctly at the end of the quarter and has been operating successfully for 90 percent of the time during the quarter. Partial payments shall not be made if the system is not operating at the end of the quarter. If the system has not operated successfully for at least 90 percent of the time during the quarter, partial payment shall be prorated based on the amount of time the system operated successfully. Duration of monitoring shall be in accordance with "Monitoring" elsewhere in these special provision.

Materials Testing--Partial payments for material testing may be made based on unit costs for each test completed. The Contractor shall be responsible for costs for Creep and Shrinkage Tests until completion of the project. Payments for Creep and Shrinkage Tests may be made on a quarterly basis. Duration of testing shall be in accordance with "Monitoring" elsewhere in these special provision.

SECTION 10-4 ELECTRICAL MONITORING SYSTEMS

10-4.01 GENERAL

Scope--This work shall consist of installing the seismic monitoring system electrical work and health monitoring system electrical work in accordance with the details shown on the plans, the provisions in Section 86, "Signals, Lighting and Electrical Systems" of the Standard Specifications, the provisions in Chapter 6, "Specifications for Cabinet Models 332, 334 and 336", of the Traffic Signal Control Equipment Specifications, the Standard Plans, and these special provisions.

Electrical work shall include furnishing all labor, materials, equipment and services required to construct and install the complete seismic monitoring system and health monitoring system as shown on the plans.

System layouts are generally diagrammatic and location of equipment is approximate. Exact routing of conduits and other facilities and location of equipment is to be governed by structural conditions and other obstructions, and shall be coordinated with the work of other trades. Equipment requiring maintenance and inspection shall be located where it is readily accessible for the performance of such maintenance and inspection.

Related Work--Earthwork, foundations, mechanical, seismic monitoring casing, CIDH piling and such other work incidental to and necessary for the proper installation and operation of the seismic monitoring system and health monitoring system electrical work shall be done in accordance with the requirements specified for similar work elsewhere in these special provisions.

Order of Work-- The seismic monitoring system electrical work shall be divided into two phases, Phase I and Phase II as follows:

PHASE I

Phase I work shall include installation of seismic steel pipes in caissons at Pier 8, concrete embedment of conduits in piers and through any other concrete structures, initiation of ISDN Telephone Service for Seismic Recorder Locations No. 2 and No. 3, and any additional contract work as recommended and approved by the Engineer. Placement of seismic steel pipes and embedment of conduits shall be coordinated with the Engineer and California Division of Mines and Geology (CDMG) personnel.

PHASE II

Phase II work shall include installation of the remainder of the seismic monitoring and health monitoring system electrical items, installation of seismic equipment by CDMG personnel, installation of health monitoring equipment by California Department of Transportation personnel, testing of the seismic monitoring system and health monitoring system, and any additional work required for the complete installation of the seismic monitoring system and health monitoring system as shown on the plans and specified herein.

State-furnished Materials-- Attention is directed to Section 8-1.01, "State-Furnished Materials", of these special provisions.

The following seismic monitoring system materials will be furnished by the State for installation by the Contractor (after pre-job meeting with Caltrans Electrical Engineer, California Division of Mines and Geology (CDMG) personnel and Earthquake engineering personnel):

FBA pigtails
Seismic sensor mounting plates
"Bishops Hat" Downhole Specially formed sealed cap

The Contractor shall notify the Engineer in writing not less than 20 working days in advance when the Contractor wants CDMG personnel to deliver the State-Furnished material to the Contractor.

State-furnished and Installed Material-- The Contractor shall notify the Engineer in writing at least 30 working days in advance when the Contractor wants CDMG personnel to install and test the seismic equipment as specified elsewhere in these special provisions. The Contractor shall notify the Engineer in writing at least 30 working days in advance when the

Contractor wants Caltrans personnel to install and test the health monitoring equipment as specified elsewhere in these special provisions.

The following seismic monitoring system materials will be furnished and installed by the State personnel:

Downhole seismic sensors and cable to surface

Seismic sensors

Seismic recorders

The following health monitoring system materials will be furnished and installed by the State personnel:

Health Monitoring Accelerometers

Access and Contractor Assistance (Seismic Monitoring System).-- After all Contractor and State supplied equipment, conduit and cable has been installed, the Contractor shall provide CDMG and associated Caltrans personnel (a total of 4 personnel each day) the means and equipment to safely access and perform work at all the recorders, sensors, and antenna locations. This is to include the transportation of equipment to and from the job site, traffic control, movement of stored materials, and vehicle parking where necessary. Access is for the purpose of installation, operational testing and performing necessary system troubleshooting and repair. The estimates below are for actual work at the locations and exclude transit time to the work locations and the set-up times of any lifts, scaffolds, etc. Some of the work can be accomplished simultaneously and the CDMG personnel will meet with the Engineer and the Contractor at the job site to work out a detailed, mutually agreeable schedule, including equipment and workplace access requirement. The access and Contractor assistance durations required are described below:

1. At the seismic recorders location:

- a) Approximately 3 days access "per recorder cabinet" prior to their installation for the purpose of measuring and preparing to mount the recorders into the cabinets.
- b) Approximately 3 days access "per recorder cabinet" to install and wire the recorders.
- c) Approximately 2 days access to each recorder during the installation and testing of the seismic sensors wired to that specific recorder location.
- d) Approximately 3 days access per recorder during the final system testing and any necessary troubleshooting and repair.

2. At the seismic sensor enclosure locations:

- a) Approximately 30 minutes access time at each enclosure on a minimum of two occasions for installation and operational testing of each sensor.

3. At the down hole and free field locations:

- a) Approximately 1/2 day access time for each down hole and free field location plus two additional days for wiring and testing.

Access and Contractor Assistance (Health Monitoring System).-- After all Contractor and state supplied equipment, conduit and cable has been installed, the Contractor shall provide Caltrans and associated Caltrans personnel, (a total of 4 personnel each day) the means and equipment to safely access and perform work at the data collection box, DC power supply, and at all sensor locations. This is to include the transportation of equipment to and on the job site, traffic control, movement of stored materials, and vehicle parking where necessary. Access is for the purpose of installation, operational testing and performing necessary system troubleshooting and repair. The estimates below are for actual work at the locations and exclude transit time to the work locations and the set-up times of any lifts, scaffolds, etc. Some of the work can be accomplished simultaneously and the Caltrans personnel will meet with the Engineer and the Contractor at the job site to work out a detailed, mutually agreeable schedule, including equipment and workplace access requirement. The access and Contractor assistance durations required are described below:

1. At the data collection box:

Approximately 2 days for the purpose of verifying sensor conductor installation and continuity.

2. At the DC power supply:

Approximately 1 day for the purpose of verifying the power supply installation and output voltage.

3. At each sensor location:

Approximately 60 minutes access time at each enclosure on a minimum of two occasions for the purpose of installation and operational testing to accomplish required work.

TESTING

After the complete installation of the seismic monitoring system by both the Contractor and CDMG personnel, the complete system will be tested by CDMG personnel in the presence of the Engineer to demonstrate that it is working properly. Any problems associated with the equipment installed by the Contractor (State or Contractor supplied) shall be, adjusted, replaced, or repaired as required at the Contractors expense, and the complete system shall be retested. If problems occur with State installed equipment, it will be replaced, or repaired as required, and retested all at the States expense. The Contractor shall provide 120 V(ac), single phase, 60 Hz power for each recorder location for the duration of the testing if main power is not yet available.

After the complete installation of the health monitoring system by both the Contractor and Caltrans personnel, the complete system will be tested by Caltrans personnel in the presence of the Engineer to demonstrate that it is working properly. Any problems associated with the equipment installed by the Contractor (State or Contractor supplied) shall be, adjusted, replaced, and/or repaired as required at the Contractors expense, and the complete system shall be retested. If problems occur with State installed equipment, it will be replaced, or repaired as required, and retested all at the States expense. The Contractor shall provide 120 V (ac), single phase, 60 Hz (sine wave) power to the receptacle supplying the UPS for the duration of the testing.

SUBMITTALS.--

Product Data.--A list of materials and equipment to be installed, manufacturer's descriptive data, and such other data as may be requested by the Engineer shall be submitted for approval.

Manufacturer's descriptive data shall include complete description, performance data and installation instructions for the materials and equipment specified herein. Control and wiring diagrams, rough-in dimensions for recessed junction and pull boxes, and component layout shall be included where applicable. All control and power conductors on the shop drawings shall be identified with wire numbers.

Manufacturer's descriptive data shall be submitted for the following:

- Seismic Sensor Cable
- Telephone (ISDN) cable
- Interconnect cable
- Manhole (for Freefield)
- Junction boxes
- Seismic sensor enclosures (Cast and NEMA 4X SST)
- Pull boxes
- Downhole box
- Receptacles
- Seismic recorder cabinets
- Pile cap pull box
- Health monitoring accelerometer enclosure
- Health monitoring cable
- DC power supply
- Uninterruptable power supply
- Data collection box
- Disconnect switches

10-4.02 CONDUIT AND FITTINGS

Conduit, General.--Conduit shall conform to Section 86-2.05 "Conduit" in the Standard Specifications and as specified in these special provisions.

Rigid steel conduit shall be used unless otherwise shown on the plans or specified in these special provisions.

Rigid non-metallic conduit shall be used at the locations shown on the plans for direct underground burial outside the building foundation.

Unless otherwise specified or shown on the plans, liquid-tight flexible metal conduit shall be used on the bridge at the locations shown on the plans.

PVC coated rigid steel conduit shall be used on the pile caps and piers to a height of 6.1 m above the pile cap. This conduit shall be installed with "clamp backs" to space conduit off the concrete surface.

Conduit trade sizes are shown on the plans. No deviation from the conduit size shown on the plans will be permitted without written permission from the Engineer.

Conduits shall be tightly covered and well protected during construction using metallic bushings and bushing "pennies" to seal open ends.

Rigid non-metallic conduit bends of 30 degrees or greater shall be factory-made long radius sweeps. Bends less than 30 degrees shall be made using an approved heat box.

A pull rope shall be installed in all empty conduits. At least one meter of pull rope shall be doubled back into the conduit at each termination.

Locations of conduit runs shall be planned in advance of the installation and coordinated with the electrical work shown on "Roadway Electrical Plans" in the same areas and shall not unnecessarily cross other conduits or pipe, nor prevent removal of ceiling tiles or panels, nor block access to mechanical or electrical equipment.

Where practical, conduits shall be installed in groups in parallel, vertical or horizontal runs and at elevations that avoid unnecessary offsets.

Exposed conduit shall be installed parallel and at right angles to the building lines or bridge line.

All raceway systems shall be secured to the structures using specified fasteners, clamps and hangers. Mechanical wedge anchors for mounting conduits to the concrete structure shall have a 32 mm embedding maximum. The drilled holes for embedding shall be a maximum of 35 mm deep. The only exception to these drilled hole and embedding depths will be as approved by the Engineer.

Single conduit runs shall be supported by using one hole pipe clamps. Where run horizontally on walls in damp or wet locations, conduit shall be installed with "clamp backs" to space conduit off the surface.

Multiple conduit runs shall be supported with construction channel secured to the building structure. Conduits shall be fastened to construction channel with channel compatible pipe clamps.

Raceways of different types shall be joined using approved couplings or transition fittings.

Expansion couplings shall be installed where conduit crosses a building separation or bridge expansion joint.

All conduit across regions of movement (hinges and abutments) shall be liquid-tight flexible metal conduit with slack to accommodate the movement expected.

Expansion deflection fittings shall conform to Section 86-2.05D, "Expansion Fittings," in the Standard Specifications and shall be used for expansion joint of 38 mm movement rating or less.

Conduit Terminations.--Rigid steel conduits shall be securely fastened to cabinets, boxes and gutters using 2 locknuts and specified insulating metallic bushing. Electrical metallic tubing shall be securely fastened to cabinets, boxes and gutters using specified connectors. Conduit terminations at exposed weatherproof enclosures and cast outlet boxes shall be made watertight using specified hubs.

Grounding bushings with bonding jumpers shall be installed on all type of conduits terminating at concentric knockouts and on all conduits containing service conductors, grounding electrode conductor, and conductors feeding separate buildings.

10-4.03 CONDUCTORS AND WIRING

Seismic Sensor Cable.-- Seismic sensor cable, SSC, shall be 8 tinned copper insulated conductors (4 twisted pairs with individual drain wires), AWG No. 22 (7 x 30 stranded), insulation 0.18 mm thick, individually shielded pairs with an aluminum-polyester shield and a AWG No. 22 stranded tinned copper drain wire, overall nominal outside diameter of 8 mm or less and outer jacket 0.23 mm thick. Cable shall be instrument cable, NEC rated CLP2 plenum cable rated for 150°C. Cable shall be similar to Belden's plenum cable, Catalog No. 87778 but with only four pairs and having a color code as specified below:

Color Code: 1st pair - red, black;
2nd pair - white, brown;
3rd pair - blue, violet;
4th pair - yellow, orange

Seismic sensor cable shall be either United Wire and Cable Co., Inc.; Consolidated Wire and Cable; or equal.

Cable spools shall be of sufficient length to allow cables to be installed without splices from the sensor enclosures to the recorder locations as shown on the plans. Only by permission from the Engineer will splices in these continuous runs be allowed.

Telephone Cable.-- Telephone cable shall be rated to be used for Integrated Signal Digital Network (ISDN) installations with 2 twisted shielded conductor pairs, minimum conductor size of AWG No. 20 tinned copper, polyethylene insulated, with a foil aluminum-polyester shield, drain wire and chrome PVC jacket rated for 300 V and underground installation.

Interconnect Cable.-- Interconnect cable (IC) shall be EIA RS-485 applications rated, Plenum type, NEC rated CL2P for temperature up to 150°C. Cable shall be similar to Belden's cable No. 9844, but plenum rated. The cable shall have 8 tinned copper insulated conductors (4 twisted pairs). Overall aluminum-polyester shield and a No. 24 AWG stranded tinned copper drain wire. Overall tinned copper braid shield shall provide at least 90 percent coverage. The IC cable shall have the overall nominal diameter, O.D., of 9 mm or less, with an minimum outer jacket of 0.23 mm thick.

Color Code: 1st pair-White/Blue Stripe, Blue/White Stripe;
2nd pair-White/Orange Stripe, Orange/White Stripe;
3rd pair-White/Green Stripe, Green/White Stripe,
4th pair-White/Brown Stripe, Brown/White Stripe.

Interconnect cable shall be either United Wire and Cable Co., Inc.; Consolidated Wire and Cable; or equal.

Cable spools shall be of sufficient length to allow cables to be installed without splices.

Health Monitoring Cable.-- Health monitoring cable (HM) shall be 2 tinned copper conductors (1 twisted , shielded pair with drain wire), No. 16 AWG (19 x 29 stranded), insulation 0.81 mm thick, with an aluminum-polyester shield and a No. 18 AWG stranded tinned copper drain wire, overall nominal outside diameter of 8 mm or less and outer jacket 0.81 mm thick. Cable shall be instrument cable, NEC rated CLP2 plenum cable rated for 150°C. Cable shall be similar to Beldon's plenum cable, Catalog No. 8719, but with only one pair of conductors. Cable spools shall be of sufficient length to allow cables to be installed without splices from the sensor enclosures to the data collection box as shown on the plans.

Conductors.--Conductors shall conform to Section 86-2.08, "Conductors," in the Standard Specifications and these special provisions.

The minimum insulation thickness, at any point, for Type THW and TW wires shall be 0.69 mm for conductor sizes No. 14 to No. 10, inclusive, 1.02 mm for No. 8, and 1.37 mm for No. 6 to No. 2, inclusive.

Conductor and Cable Installation.--Conductors shall not be installed in conduit until all work of any nature that may cause injury is completed. Care shall be taken in pulling conductors and cables that insulation is not damaged. An approved non-petroleum base and insulating type pulling compound shall be used as needed.

Seismic, health and interconnect cables shall be installed continuous without any splices. Only by permission from the Engineer will splices in these continuous runs be allowed.

Splices and joints shall be insulated with insulation equivalent to that of the conductor.

Provide 155 mm of slack at each outlet and device connection. If the outlet or device is not at the end of a run of wire, connection shall be made with correctly colored pigtails tapped to the runs with splices as specified herein.

Branch circuit conductors in panelboards and load centers shall be neatly trained along a path from the breaker terminals to their exit point. The conductors shall have ample length to transverse the path without strain, but shall not be so long as to require coiling, doubling back, or cramming. The path shall transverse the panelboard gutter spaces without entering a gutter containing service conductors and, unless otherwise shown on the plans, without entering the gutter space of any panelboard feeder.

All pressure type connectors and lugs shall be retightened after the initial set.

Splices in underground pull boxes and similar locations shall be made watertight.

Wire Connections and Devices.--Wire connections and devices shall be pressure or compression type, except that connectors for No. 10 AWG and smaller conductors in dry locations may be preinsulated spring-pressure type.

Conductor Identification.--The neutral and equipment grounding conductors shall be identified as follows:

Neutral conductor shall have a white or natural gray insulation except that conductors No. 4 and larger may be identified by distinctive white marker such as paint or white tape at each termination.

Equipment grounding conductor shall be bare or insulated. If insulated, equipment grounding conductors shall have green or green with one or more yellow stripes insulation over its entire length except that conductors No. 4 and larger may be permanently identified by distinctive green markers such as paint or green tape over its entire exposed insulation.

Feeder and branch circuit ungrounded conductors shall be color coded by continuously colored insulation, except conductors No. 6 AWG or larger may be color coded by colored tape at each connection and where accessible. Ungrounded conductor color coding shall be as follows:

SYSTEM	COLOR CODE
120/240V-Single phase	Black, blue

Seismic Sensor Cable Identification.--Each seismic sensor cable shall be tagged with the channel number as shown on the plans at each termination. Additionally, at each junction box, recorder cabinet location, and pull box that contains more than one seismic sensor cable, the cables shall be tagged. Identification shall be made with one of the methods specified under "Conductor Identification."

Health Monitoring Cable Identification.--Each health monitoring cable shall be tagged with the number as shown on the plans at each termination. Additionally, at each junction box, and pull box that contains more than one health monitoring cable, the cables shall be tagged. Identification shall be made with one of the methods specified under "Conductor Identification."

10-4.04 ELECTRICAL BOXES

Outlet, Device and Junction Boxes.—

Unless otherwise shown or specified, boxes shall be cast metal boxes and shall be the size and configuration best suited to the application indicated on the plans.

Cast metal boxes shall be cast iron boxes with threaded hubs and shall be of the size and configuration best suited to the application shown on the plans.

Cast metal boxes shall have cast metal covers with gaskets.

Seismic Junction Boxes.—

Unless otherwise shown or specified, all seismic junction boxes shall be Seismic NEMA Type 4X SST junction boxes. Seismic cast metal junction boxes shall be installed at the locations shown on the plans. Both type of boxes shall be as specified in these special provisions. The cover of both type of boxes shall have the inscription "SEISMIC JUNCTION BOX" in 25 mm high letters.

Seismic Cast Metal Junction Boxes.—

Seismic cast metal junction boxes shall be a cast ferrous metal, NEMA Type 6, gasketed screw cover box complete with external mounting lugs, weatherproof conduit hubs and size as shown on the plans.

Seismic NEMA Type 4X SST Junction Boxes.—

Seismic NEMA Type 4X SST junction box shall be a 316 or 316L stainless steel, NEMA Type 4X, hinged, gasketed cover box with weatherproof conduit hubs and size as shown on the plans.

Seismic Recorder Cabinet.--

Seismic recorder cabinet shall be Type 1B cabinet conforming to Section 2, "Housing Requirements" in Chapter 6, "Specifications for Cabinet Models 332, 334 and 336" of the Traffic Signal Control Equipment Specifications with the following exceptions:

Paragraph 6.2.1 is changed to read:

The housing shall include, but not be limited to, the following:

Enclosure	Hinges and Door Catches
Doors	Gasketing
Latches/Locks	Cage supports

Paragraphs 6.2.4. is changed to read:

The housing ventilation including intake, exhaust and filtration are as follows:

Paragraphs 6.2.4.3 and 6.2.4.4 shall be deleted.

In addition, the police panel and cabinet cage are not required.

Cabinet shipping requirements - The cabinet shall be delivered mounted on a plywood shipping pallet. The pallet shall be bolted to the cabinet base. The cabinet shall be enclosed in a slipcover cardboard packing shell. The housing doors shall be blocked to prevent movement during transportation.

All bolts, nuts, washers, screws (size 8 or larger), hinges and hinge pins shall be stainless steel unless otherwise specified.

Data Collection Box.—

Data collection box shall be a 316 or 316L stainless steel NEMA Type 4X, hinged cover box 610 mm wide x 920 mm high x 305 mm deep. The hinge shall be on the long side and the cover shall have restrainers to hold it open at 90 degrees.

DC Power Supply Enclosure.—

DC power supply enclosure shall be a 16 gage galvanized steel, NEMA Type 3R, vented, hinged cover box. The enclosure shall be factory painted gray enamel outside and white enamel inside. The enclosure size shall be as required to fit the equipment inside as shown on the plans and a minimum of 915 mm x 915 mm x 455 mm deep.

Health Monitoring Accelerometer Enclosure (cast).—

Health monitoring accelerometer enclosure (cast) shall be a cast ferrous metal, NEMA Type 6, gasketed screw cover box. The cover shall have the inscription "HEALTH MONITORING ENCLOSURE" in 26 mm high letters. The enclosure size shall be 305 mm x 410 mm x 205 mm.

Health Monitoring Accelerometer Enclosure (galvanized).—

Health monitoring accelerometer enclosure (galvanized) shall be a 16 gage galvanized steel, NEMA Type 3R, vented, hinged cover box. The enclosure shall be factory painted gray enamel outside and white enamel inside. The enclosure size shall be 305 mm x 410 mm x 205 mm.

Seismic Sensor Enclosures.--

All seismic sensor enclosures, except sensor enclosure Type 6, shall be stainless steel NEMA Type 4X, 316 or 316L, hinged cover box of dimensions shown on the plans. A nameplate with the inscription "SEISMIC ENCLOSURE #" in 25 mm high letters shall be installed on the front cover (the # shall correspond to the # of the enclosure shown on the plans).

The backside of the enclosure shall be a flush and smooth surface. The enclosure shall be Hoffman, Catalog No. A-1412CHNFSS6; -Circle AW, Catalog No. 14126-4XSCHC (without upper and lower mounting flanges and with padlock hasp similar to Catalog No. A-PLKJIC; or equal.

A nameplate with the inscription "SEISMIC ENCLOSURE #" shall be installed on the front cover (the # shall correspond to the # of the enclosure shown on the plans). The backside of the enclosure shall have a flush smooth surface.

Seismic Sensor Enclosure Type 6.--

Seismic sensor enclosure Type 6, shall be a cast ferrous metal NEMA Type 6, box with gasketed screw cover box, 150 mm deep and of dimensions shown on the plans. Seismic sensor enclosure cover shall have raised cast inscription "SEISMIC ENCLOSURE #" in 26 mm high letters (the # shall correspond to the # of the enclosure shown on the plans).

The box shall be able to withstand submersion in water up to 2 meters depth for extended periods. A minimum of two cast mounting lugs shall be attached on two opposing sides of the enclosure. The enclosure shall have a bossed, drilled and tapped (NPT) hole to accept a 27 mm conduit connector, centered between the mounting lugs on one side only. The enclosure shall also have a mounting button drilled and tapped for 6 mm x 20 located in the center (+/- 3 mm) of the inside bottom of the enclosure.

The enclosure shall be O-Z Gedney, Catalog No. YF-121206-SUB, with raised cast lettering, "SEISMIC ENCLOSURE", in the cover, mounting button P/N 1 MBT (installed in the center inside the bottom of the box), mounting lugs P/N 4ML1816 attached to each side, and one P/N BDT100 conduit connector hole centered between mounting lugs on one side; Crouse Hinds, Catalog No. WCB121208-1000G (except box shall be 150 mm deep), with mounting straps and raised cast lettering, "SEISMIC ENCLOSURE", in the cover, mounting pad blind tapped for 6 mm x 20 installed in the center of the inside bottom of the enclosure, and one drilled and tapped (NPT) 27 mm conduit hole centered between the mounting straps on one side only; or equal.

Manholes.--

Manholes shall be 1220 mm x 1220 mm (inside dimensions) x 610 mm deep with 155 mm thick walls, bottom and top. The manhole shall be precast or cast-in-place concrete designed for H-20-44 Bridge loading. A 915 mm square hole shall be cut out or formed within the bottom of the manhole. The frame and cover shall be cast iron and cover shall have provisions for hold down bolts. Bolts shall be included. Conduits terminating inside the manhole shall end with bushings specified elsewhere in these special provisions. A cable pulling iron shall be installed in the wall opposite each conduit entrance. Manhole cover shall be engraved "SEISMIC" in 25 mm high letters.

The top of the manhole shall be installed 15 mm above the finished grade in unpaved areas and flush with grade in paved areas. Where conduits enter the manhole, the space around the conduits shall be grouted tightly or cast or cast in the wall. Concrete foundation and slab, and pea gravel shall be installed as shown on the plans.

Downhole Box.--

Downhole box shall be high density reinforced concrete box having an inside diameter of 356 mm minimum. The box shall be designed for installation in heavy truck traffic areas. Box cover shall be cast iron with provisions for hold down bolts. Bolts shall be included. Box cover shall be marked "SEISMIC".

Downhole box installation shall be installed 15 mm above the finished grade in unpaved areas and flush with grade in paved areas. Where conduits enter the manhole, the space around the conduits shall be grouted tightly or cast through the bottom.

Down Hole Junction Box.-- Down hole junction box shall be the same as seismic sensor enclosure (Type 10) except the box size shall be 355 mm x 205 mm x 155 mm deep. Cast mounting lugs shall be attached on 205 mm, minimum of two lugs each side. One each bossed, drilled and tapped (NPT) hole to accept a 53 mm conduit connector centered between mounting lugs on one side only. One each bossed, drilled and tapped (NPT) hole to accept a 27 mm water tight strain relief connector per down hole cable as required. These holes are to be centered between the lid and the bottom along a 355 mm side of the box. The box shall be O-Z Gedney, Catalog No. YF-140806-SUB with mounting lugs, Catalog No. 4ML1816, one hole, Catalog No. BDT200, and appropriate number of holes for down hole cables, Catalog No. BDT100; Crouse-Hinds, Catalog No. WCB120806-3-0000G0(****)00 (except box shall be 355 mm long); or equal. In the Crouse Hinds box catalog number the ****s represent the appropriate number of conduits required for a given box.

Down hole junction box installation shall be as shown on the plans.

Pile Cap Pull Box.--

Pile cap pull box shall be a fiberlyte pull box with a flanged bottom rim suitable for bolting to a horizontal surface. The pull box shall have nominal dimensions of 435 mm x 765 mm x 460 mm deep for shallow downholes and 330 mm x 610 mm x 460 mm deep for deep downholes. The lid shall be a bolt down type.

Pile cap pull box installation shall be as shown on the plans.

Underground Pull Box.--

Pull boxes shall be high density reinforced concrete box with ultraviolet inhibitor polyethylene etched face anchored in concrete and fiberglass cover with hold down bolts. The polyethylene and fiberglass material shall be fire resistant and show no appreciable change in physical properties with exposure to the weather.

Traffic rated pull boxes shall be high density reinforced concrete box with steel cover with hold down bolts and bonding strap. Pull box and cover shall be designed for H20 loading. No. 3 1/2 pull box shall have inside dimensions of 270 mm by 440 mm and No. 5 pull box shall have inside dimensions of 335 mm by 610 mm.

Electrical pull box covers or lids shall be marked "ELECTRICAL." Telephone service pull box covers or lids shall have plain, unmarked covers.

Seismic underground pull box covers or lids shall be marked "SEISMIC."

The bottom of pull boxes shall be bedded in 155 mm of clean, crushed rock or gravel and shall be grouted with 40 mm thick grout prior to installation of conductors. Grout shall be sloped to a 25 mm PVC pipe drain hole. Conduit shall be sealed in place with grout.

Top of pull boxes shall be flush with surrounding grade or top of curb. In unpaved areas where pull box is not immediately adjacent to and protected by a concrete foundation, pole or other protective construction, the top of pull box shall be set at plus 30 mm above surrounding grade. Pull boxes shown on the plans in the vicinity of curbs shall be placed adjacent to the back of curb. Pull boxes shown on the plans adjacent to lighting standards shall be placed on the side of foundation facing away from traffic.

10-4.05 RECEPTACLES AND SWITCHES

Duplex Receptacles.--

Duplex receptacles shall be NEMA Type 5-20R, 3-wire, 20-ampere, 125-volt AC, safety grounding, ivory color, specification grade receptacle suitable for wiring with stranded conductors.

Ground Fault Circuit Interrupter Receptacles, (GFCI).--

Ground fault circuit interrupter receptacles shall be NEMA Type 5-20R, feed-through type, ivory color, 3-wire, 20-ampere, 125-volt AC, grounding type, specification grade, duplex receptacle with ground fault interruption. Receptacle shall detect and trip at current leakage of 5 milliamperes and shall have front mounted test and reset buttons.

Snap Switches.--

Snap switches shall be 20-ampere, 120/277-volt AC, quiet type, specification grade, ivory color switch with silver cadmium alloy contacts. Switch shall be suitable for wiring with stranded conductors.

10-4.06 MISCELLANEOUS MATERIALS

Warning Tape.--

Warning tape shall be 100 mm wide and contain the printed warning "CAUTION ELECTRICAL CONDUIT" in bold 19 mm black letters at 760 mm intervals on bright orange or yellow background. The printed warning shall be non-erasable when submerged under water and resistant to insects, acids, alkali, and other corrosive elements in the soil. The tape shall have a tensile strength of not less than 70 kg per 100 mm wide strip and shall have a minimum elongation of 700 percent before breaking.

Pull Ropes.--

Pull ropes shall be nylon or polypropylene with a minimum tensile strength of 225 kg.

Watertight Conduit Plugs.--

Watertight conduit plugs shall be a hollow or solid stem expansion plugs complete with inner and outer white polypropylene compression plates and red thermoplastic rubber seal. Seal material shall be non-stick type rubber resistant to oils, salt, and alkaline substances normally available at the construction sites.

Anchorage Devices.--

Anchorage devices shall be corrosion resistant, toggle bolts, wood screws, bolts, machine screws, studs, expansion shields, and expansion anchors and inserts. Mechanical wedge anchors for mounting conduits to the concrete structure shall have a 32 mm embedding maximum. The drilled holes for embedding shall be a maximum of 35 mm deep. The only exception to these drilled hole and embedding depths will be as approved by the Engineer.

Electrical Supporting Devices.--

Electrical supporting devices shall be one hole conduit clamps with clamp backs, hot-dipped galvanized, malleable cast iron.

Construction channel shall be 41 mm x 41 mm, 2.66 mm (12-gage) galvanized steel channel with 13 mm diameter bolt holes, 40 mm on center in the base of the channel.

Equipment Identification.--

Equipment shall be identified with nameplates fastened with self-tapping, cadmium-plated stainless steel screws or nickel-plated bolts.

Nameplate inscriptions shall read as shown on the plans.

10-4.07 TELEPHONE SERVICE

Utility Connection.--The Contractor shall make all arrangements and obtain all permits and licenses required for the extension of and connection to an ISDN telephone service applicable to this project, shall furnish all labor and materials necessary for such extensions which are not performed or provided by the utility, and shall furnish and install any intermediate equipment required by the serving utilities.

Upon written request by the Contractor, the State will pay all utility permits, licenses, connection charges, and excess length charges directly to the utility. Such request shall be submitted not less than 15 days before service connections are required.

The costs incurred by the Contractor for the extension of utilities beyond the limits shown on the plans, and in furnishing and installing any intermediate equipment required by the serving utilities, will be paid for as an ordered change as provided for elsewhere in these special provisions.

Full compensation for any costs incurred by the Contractor to obtain the permits and licenses shall be considered as included in the contract lump sum price and no additional compensation will be allowed therefore.

Installation Details.--The Contractor shall submit complete service installation details to the serving utilities for approval. Prior to submitting installation details to the serving utility, the Contractor shall have said drawings reviewed and stamped "APPROVED" by the Engineer. Submittals shall be approved by the serving utility prior to commencing work.

Installation of service equipment shall be in accordance with the requirements of the serving utilities as shown on the approved installation details.

10.4.08 ELECTRICAL EQUIPMENT

Disconnect Switch.--Disconnect switch shall be 1-pole, 120-volt, AC, 20-ampere, circuit breaker fused, safety switch in a NEMA-3R enclosure. The circuit breaker shall have lugs for conductor connections. The enclosure shall be sized to accommodate power terminal blocks, a (neutral) terminal block, and ground (bus) terminal block. All terminal blocks shall be able to terminate 5 conductors (4 of No. 12 AWG size, and one of the size shown on the plans for the incoming power, ground, or neutral conductor). A disconnect switch shall be installed inside each recorder cabinet as shown on the plans.

DC Power Supply.--DC power supply shall be a regulated DC power supply with 28 volt output and minimum of 10 amperes. Output voltage shall be regulated to 0.5 percent. Input voltage shall 120 volts, single-phase AC power. DC power supply shall be Condor Model Number F24-12-A+, Xantek Model XE240, Acopian Model Number H11, or equal.

DC power supply shall be installed inside the DC power supply enclosure as shown on the plans.

Uninterruptible Power Supply (UPS).--UPS shall be 120 volt AC input, 1000 VA power rating on line UPS. Transfer time to battery backup shall be less than 4 milliseconds. The UPS shall have maintenance free, sealed batteries. Battery back up time shall be a minimum of 12 minutes at full load. The unit shall have standard NEMA 5-15R receptacles for output voltage. Operating temperature range shall be from 0°C to 40°C and up to 95 percent humidity. The unit shall be Topaz, Best, Liebert, or equal.

UPS shall be installed inside the DC power supply enclosure.

10-4.09 MEASUREMENT AND PAYMENT

Seismic monitoring electrical system shall be paid for on a lump sum price.

The contract lump sum price paid for seismic monitoring system shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals (except state furnished materials and labor), and for doing all the work involved in furnishing and installing the seismic monitoring system, complete in place, including transportation and storage of state furnished materials, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Health Monitoring electrical system shall be paid for on a lump sum price.

The contract lump sum price paid for health monitoring system shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals (except state furnished materials and labor), and for doing all the work involved in furnishing and installing the health monitoring system, complete in place, including transportation and storage of state furnished materials, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

SECTION 11. (BLANK)

SECTION 12. BUILDING WORK

SECTION 12-1. GENERAL REQUIREMENTS

12-1.01 SCOPE

Building work described herein and as shown on the plans shall conform to the requirements of these special provisions and Sections 1 through 9 of the Standard Specifications. Sections 10 through 95 of the Standard Specifications shall not apply to the work in this Section 12 except when specific reference is made thereto.

The building work to be done consists, in general, of constructing a 105 m² electrical substation with cast-in-place concrete slab, concrete walls, and concrete roof, including related electrical work, and such other items or details, not mentioned above, that are required by the plans, Standard Specifications, or these special provisions shall be performed, placed, constructed or installed.

12-1.02 ABBREVIATIONS

Section 1-1.02, "Abbreviations," of the Standard Specifications is amended by adding the following:

AAMA	American Architectural Manufacturers' Association
ACI	American Concrete Institute
AGA	American Gas Association
AITC	American Institute of Timber Construction
AMCA	Air Movement and Control Association
APA	American Plywood Association
ARI	American Refrigeration Institute
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
CS	Commercial Standards (US Department of Commerce)
ESO	Electrical Safety Orders
FGMA	Flat Glass Marketing Association
FM	Factory Mutual
FS	Federal Specification
ICBO	International Conference of Building Officials
NAAMM	National Association of Architectural Metal Manufacturers
NBFU	National Board Fire Underwriters
NEC	National Electrical Code
NFPA	National Fire Protection Association
PEI	Porcelain Enamel Institute
PS	Product Standard (US Department of Commerce)
RIS	Redwood Inspection Service
SCPI	Structural Clay Products Institute
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
SSPC	Steel Structures Paint Council
TCA	Tile Council of America
TPI	Truss Plate Institute
UBC	Uniform Building Code
UL	Underwriters Laboratories, Inc.
WCLIB	West Coast Lumber Inspection Bureau (stamped WCLB)
WCLB	Grade stamp for WCLIB
WIC	Woodwork Institute of California
WWPA	Western Wood Products' Association

When reference is made to the Uniform Building Code (UBC) on the plans or in the special provisions, it shall be the 1997 Uniform Building Code as amended by the 1998 Title 24 California Building Standards Code.

12-1.03 GUARANTEE

The Contractor hereby unconditionally guarantees that the building work will be done in accordance with the requirements of the contract, and further guarantees the building work of the contract to be and remain free of defects in workmanship and materials for a period of one year from the date of acceptance of the contract, unless a longer guarantee period is required elsewhere in these special provisions. The Contractor hereby agrees to repair or replace any and all building work, together with any other adjacent work which may be displaced in so doing, that may prove to be not in accordance with the requirements of the contract or that may be defective in its workmanship or material within the guarantee period specified, without any expense whatsoever to the Department, ordinary wear and tear and unusual abuse or neglect excepted.

The performance bond for the contract, or a portion thereof, in the sum equal to one-half the contract price of the building work, shall remain in full force and effect during the guarantee period.

The Contractor further agrees, that within 10 calendar days after being notified in writing by the Department of any building work not in accordance with the requirements of the contract or any defects in the building work, he shall commence and prosecute with due diligence all work necessary to fulfill the terms of this guarantee, and shall complete the work within a reasonable period of time, and, in the event he fails to comply, he does hereby authorize the Department to proceed to have such work done at the Contractor's expense and he shall honor and pay the cost and charges therefor upon demand. The Department shall be entitled to all costs and expenses, including reasonable attorney's fees, necessarily incurred upon the Contractor's refusal to honor and pay the above costs and charges.

12-1.04 AREAS FOR CONTRACTOR'S USE

No area is available within the contract limits for the exclusive use of the Contractor. The Contractor shall arrange with the Engineer for areas to store equipment and materials within the work area.

12-1.05 COOPERATION

Attention is directed to Sections 7-1.14, "Cooperation," and 8-1.10, "Utility and Non-Highway Facilities," of the Standard Specifications and these special provisions.

Work by State forces will be in progress within the contract limits during the working period for this contract.

The Contractor shall plan his work to minimize interference with State forces and the public. Interruptions to any services for the purpose of making or breaking a connection shall be made only after consultation with and for such time periods as directed by the Engineer.

12-1.06 SUBMITTALS

Working drawings, material lists, descriptive data, samples and other submittals specified in these special provisions shall be submitted for approval in accordance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications and these special provisions.

Unless otherwise permitted in writing by the Engineer, all submittals required by these special provisions shall be submitted within 35 days after the contract has been approved.

Attention is directed to the provisions in Section 5-1.01, "Authority of Engineer," of the Standard Specifications. The Engineer may request submittals for materials or products where submittals have not been specified in these special provisions, or may request that additional information be included in specified submittals, as necessary to determine the quality or acceptability of such materials or products.

Attention is directed to Section 6-1.05, "Trade Names and Alternatives," of the Standard Specifications. The second indented paragraph of the first paragraph of said Section 6-1.05 is amended to read:

Whenever the specifications permit the substitution of a similar or equivalent material or article, no test or action relating to the approval of such substituted material will be made until the request for substitution is made in writing by the Contractor accompanied by complete data as to the equality of the material or article proposed. Such request shall be made within 35 days after the date the contract has been approved and in ample time to permit approval without delaying the work, but need not be made in less than 35 days after award of the contract.

Work requiring the submittal of working drawings, material lists, descriptive data, samples, or other submittals shall not begin prior to approval of said submittal by the Engineer. Fifteen working days shall be allowed for approval or return for correction of each submittal or resubmittal. Should the Engineer fail to complete his review within the time specified and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in review, an extension of time commensurate with the delay in completion of the work thus caused will be granted as provided in Section 8-1.07, "Liquidated Damages," of the Standard Specifications.

Submittals shall be delivered to the locations indicated in these special provisions. If a specific location is not indicated, the submittal shall be delivered to the Division of Structure Design, Documents Unit, Fourth Floor, Mail Station 9-4/4I, 1801 30th Street, Sacramento, California 95816, telephone (916) 227-8252, or the submittals shall be mailed to the Division of Structure Design, Documents Unit, Mail Station 9, P. O. Box 942874, Sacramento, California 94274-0001.

Each submission of drawings, material lists and descriptive data shall consist of at least 5 copies. Two copies will be returned to the Contractor either approved for use or returned for correction and resubmittal.

Each separate item submitted shall bear a descriptive title, the name of the project, district, county, and contract number. Plans and detailed drawings shall be not larger than 559 mm x 914 mm.

The material list shall be complete as to name of manufacturer, catalog number, size, capacity, finish, all pertinent ratings, and identification symbols used on the plans and in the special provisions for each unit.

Parts lists and service instructions packaged with or accompanying the equipment installed in the work shall be delivered to the Engineer at the jobsite. Required operating and maintenance instructions shall be submitted in triplicate.

Manufacturer's warranties for products installed in the work shall be delivered to the Engineer at the jobsite.

Unapproved samples and samples not incorporated in the work shall be removed from State property, when directed by the Engineer.

12-1.07 PROGRESS SCHEDULE

A progress schedule shall be submitted in duplicate for the building work in accordance with the requirements in Section 8-1.04, "Progress Schedule," of the Standard Specifications.

12-1.08 SCHEDULE OF VALUES

The Contractor shall prepare and submit to the Engineer 2 copies of a Schedule of Values covering each lump sum item for building work. The Schedule of Values, showing the value of each kind of work, shall be acceptable to the Engineer before any partial payment estimate is prepared.

The sum of the items listed in the Schedule of Values shall equal the contract lump sum price for building work. Overhead and profit shall not be listed. Bond premium, temporary construction facilities, plant, and other such items will not be paid for under the various building work items and shall be included in the mobilization bid item for the entire project.

12-1.09 INSPECTION

All items covered or all stages of work that are not to remain observable must be inspected and approved before progress of work conceals portions to be inspected. The Contractor shall notify the Engineer not less than 72 hours in advance of when such inspection is needed.

12-1.10 OBSTRUCTIONS

Attention is directed to Sections 7-1.11, "Preservation of Property," 7-1.12, "Responsibility for Damage," 7-1.16, "Contractor's Responsibility for the Work and Materials," and 8-1.10, "Utility and Non-Highway Facilities," of the Standard Specifications.

The Contractor shall notify the Engineer and the appropriate regional notification center for operators of subsurface installations at least 5 working days prior to performing any excavation or other work close to any underground pipeline, conduit, duct, wire or other structure. Regional notification centers include but are not limited to the following:

Underground Service Alert
Northern California (USA)
Telephone: 1(800)642-2444

Underground Service Alert
Southern California (USA)
Telephone: 1(800)422-4133

South Shore Utility
Coordinating Council (DIGS)
Telephone: 1(800)541-3447

Western Utilities
Underground Alert, Inc.
Telephone: 1(800)424-3447

12-1.11 PRESERVATION OF PROPERTY

Attention is directed to Sections 7-1.11, "Preservation of Property," 7-1.12, "Responsibility for Damage," 7-1.16, "Contractor's Responsibility for the Work and Materials," and 8-1.10, "Utility and Non-Highway Facilities," of the Standard Specifications.

Operations shall be conducted in such a manner that existing facilities, surfacing, installations, and utilities which are to remain in place will not be damaged. Temporary surfacing, facilities, utilities and installations shall also be protected until they are no longer required. The Contractor, at his expense shall furnish and install piling, sheet piling, cribbing, bulkheads, shores, or whatever means may be necessary to adequately support material carrying such facilities, or to support the facilities themselves and shall maintain such support until they are no longer needed.

12-1.12 MEASUREMENT AND PAYMENT

The contract lump sum price paid for building work shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the building work, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for any incidental materials and labor, not shown on the plans or specified, which are necessary to complete the buildings and appurtenances shall be considered as included in the contract lump sum price paid for building work and no additional compensation will be allowed therefor.

12-1.13 SUBSTITUTION OF NON-METRIC MATERIALS AND PRODUCTS

Only materials and products conforming to the requirements of the specifications shall be incorporated in the work. When metric materials and products are not available, and when approved by the Engineer, and at no cost to the State, materials and products in the inch-pound (imperial) system which are of equal quality and of the required properties and characteristics for the purpose intended, may be substituted for the equivalent metric materials and products, subject to the following requirements:

Materials and products shown on the plans or in the special provisions as being equivalent may be substituted for the metric materials and products specified or detailed on the plans.

Before other non-metric materials and products will be considered for use the Contractor shall furnish, at the Contractor's expense, evidence satisfactory to the Engineer that the materials and products proposed for use are equal to or better than the materials and products specified or detailed on the plans. The burden of proof as to the quality and suitability of substitutions shall be upon the Contractor and the Contractor shall furnish all information necessary as required to the Engineer. The Engineer will be the sole judge as to the quality and suitability of the substituted materials and products and the Engineer's decision shall be final.

When the Contractor elects to substitute non-metric materials and products, including materials and products shown on the plans or in the special provisions as being equivalent, a list of substitutions to be made shall be submitted for approval.

The following substitutions of materials and products will be allowed:

SUBSTITUTION TABLE FOR SIZES OF HIGH STRENGTH STEEL FASTENERS, ASTM Designation: A 325M	
METRIC SIZE SHOWN ON THE PLANS mm x thread pitch	IMPERIAL SIZE TO BE SUBSTITUTED inch
M16 x 2	5/8
M20 x 2.5	3/4
M22 x 2.5	7/8
M24 x 3	1
M27 x 3	1-1/8
M30 x 3.5	1-1/4
M36 x 4	1-1/2

SUBSTITUTION TABLE FOR REINFORCEMENT	
METRIC BAR DESIGNATION NUMBER AS SHOWN ON THE PLANS	IMPERIAL BAR DESIGNATION NUMBER TO BE SUBSTITUTED
10	3
13	4
16	5
19	6
22	7
25	8
29	9
32	10
36	11
43	14
57	18

SUBSTITUTION TABLE FOR WELDED PLAIN WIRE REINFORCEMENT, ASTM DESIGNATION: A 185	
	US CUSTOMARY UNITS SIZE TO BE SUBSTITUTED inch ² x 100
MW9	W1.4
MW10	W1.6
MW13	W2.0
MW15	W2.3
MW19	W2.9
MW20	W3.1
MW22	W3.5
MW25	W3.9, except W3.5 in piles only
MW26	W4.0
MW30	W4.7
MW32	W5.0
MW35	W5.4
MW40	W6.2
MW45	W6.5
MW50	W7.8
MW55	W8.5, except W8.0 in piles only
MW60	W9.3
MW70	W10.9, except W11.0 in piles only
MW80	W12.4
MW90	W14.0
MW100	W15.5

The sizes in the following tables of materials and products are exact conversions of metric sizes of materials and products and are listed as acceptable equivalents:

CONVERSION TABLE FOR SIZES OF: (1) STEEL FASTENERS FOR GENERAL APPLICATIONS, ASTM Designation: A 307 or AASHTO Designation: M 314, Grade 36 or 55, and (2) HIGH STRENGTH STEEL FASTENERS, ASTM Designation: A 325 or A 449	
DIAMETER	
METRIC SIZE SHOWN ON THE PLANS mm	EQUIVALENT IMPERIAL SIZE inch
6, or 6.35	1/4
8 or 7.94	5/16
10, or 9.52	3/8
11, or 11.11	7/16
13 or 12.70	1/2
14, or 14.29	9/16
16, or 15.88	5/8
19, or 19.05	3/4
22, or 22.22	7/8
24, 25, or 25.40	1
29, or 28.58	1-1/8
32, or 31.75	1-1/4
35, or 34.93	1-3/8
38 or 38.10	1-1/2
44, or 44.45	1-3/4
51, or 50.80	2
57, or 57.15	2-1/4
64, or 63.50	2-1/2
70 or 69.85	2-3/4
76, or 76.20	3
83, or 82.55	3-1/4
89 or 88.90	3-1/2
95, or 95.25	3-3/4
102, or 101.60	4

CONVERSION TABLE FOR NOMINAL THICKNESS OF SHEET METAL			
UNCOATED HOT AND COLD ROLLED SHEETS		HOT-DIPPED ZINC COATED (GALVANIZED) SHEETS	
METRIC THICKNESS SHOWN ON THE PLANS mm	EQUIVALENT US STANDARD GAGE inch	METRIC THICKNESS SHOWN ON THE PLANS mm	EQUIVALENT GALVANIZED SHEET GAGE inch
7.94	0.3125		
6.07	0.2391		
5.69	0.2242		
5.31	0.2092		
4.94	0.1943		
4.55	0.1793		
4.18	0.1644	4.270	0.1681
3.80	0.1495	3.891	0.1532
3.42	0.1345	3.510	0.1382
3.04	0.1196	3.132	0.1233
2.66	0.1046	2.753	0.1084
2.28	0.0897	2.372	0.0934
1.90	0.0747	1.994	0.0785
1.71	0.0673	1.803	0.0710
1.52	0.0598	1.613	0.0635
1.37	0.0538	1.461	0.0575
1.21	0.0478	1.311	0.0516
1.06	0.0418	1.158	0.0456
0.91	0.0359	1.006 or 1.016	0.0396
0.84	0.0329	0.930	0.0366
0.76	0.0299	0.853	0.0336
0.68	0.0269	0.777	0.0306
0.61	0.0239	0.701	0.0276
0.53	0.0209	0.627	0.0247
0.45	0.0179	0.551	0.0217
0.42	0.0164	0.513	0.0202
0.38	0.0149	0.475	0.0187

CONVERSION TABLE FOR WIRE		
METRIC THICKNESS SHOWN ON THE PLANS	EQUIVALENT USA STEEL WIRE THICKNESS	GAGE NO.
mm	inch	
6.20	0.244	3
5.72	0.225	4
5.26	0.207	5
4.88	0.192	6
4.50	0.177	7
4.11	0.162	8
3.76	0.148	9
3.43	0.135	10
3.05	0.120	11
2.69	0.106	12
2.34	0.092	13
2.03	0.080	14
1.83	0.072	15
1.57	0.062	16
1.37	0.054	17
1.22	0.048	18
1.04	0.041	19
0.89	0.035	20

CONVERSION TABLE FOR COMMON NAILS				
NAIL SIZE	METRIC		ENGLISH	
	mm		inch	
	Length	Diameter	Length	Diameter
8d	63.5	3.33	2 1/2	0.131
10d	76.2	3.76	3	0.148
16d	88.9	4.11	3 1/2	0.162

CONVERSION TABLE FOR LUMBER	
METRIC NOMINAL SURFACE DRY SIZE	EQUIVALENT NOMINAL SURFACE DRY U S SIZE
mm	inch
51	2
102	4
152	6
203	8
254	10
305	12

CONVERSION TABLE FOR PLYWOOD	
METRIC mm	ENGLISH inch
6.4	1/4
7.9	5/16
9.5	3/8
11.1	7/16
11.9	15/32
12.7	1/2
15.1	19/32
15.9	5/8
18.3	23/32
19.1	3/4
22.2	7/8
25.4	1
28.6	1 1/8

CONVERSION TABLE FOR INSULATION R-VALUE	
METRIC (m ² K/W)	ENGLISH (HR FT ² F/BTU)
0.5	3
0.7	4
1.4	8
1.9	11
2.3	13
2.5	14
3.3	19
5.3	30

CONVERSION TABLE FOR VAPOR TRANSMISSION RATING	
METRIC (Perm-m)	ENGLISH (perm-inch)
0.29	0.02

CONVERSION TABLE FOR LOW PRESSURE	
METRIC (Pa)	ENGLISH (Inches of Water Column)
30	0.125
60	0.25
90	0.375
120	0.50
150	0.60
155	0.625
175	0.70
185	0.75
200	0.80
250	1.00
310	1.25

CONVERSION TABLE FOR PRESSURE	
METRIC (kPa)	ENGLISH (psi)
10	1.5
210	30
280	40
350	50
690	100
860	125
1040	150
1100	160
1210	175
1380	200
1730	250
2070	300
2170	315
2410	350
2590	375
2760	400
4830	700
5170	750
5520	800
13800	2000
17200	2500
20700	3000
27600	4000
34500	5000
137900	20000

CONVERSION TABLE FOR MIL THICKNESS	
METRIC (mm)	ENGLISH (inch/1000)
0.10	4
0.10	5
0.50	20
0.75	30
1.00	40

CONVERSION TABLE FOR HVAC DUCTING.	
METRIC (mm)	ENGLISH (inch)
100	4
125	5
150	6
175	7
200	8
225	9
250	10
300	12
360	14
410	16
460	18
510	20
560	22
610	24
660	26
710	28
760	30

CONVERSION TABLE FOR MECHANICAL PIPING		
METRIC (GSP, PVC, BSP, DUCTILE IRON)	METRIC (mm)	ENGLISH (inch)
NPS 1/2	15	1/2
NPS 3/4	20	3/4
NPS 1	25	1
NPS 1 1/4	32	1 1/4
NPS 1 1/2	40	1 1/2
NPS 2	50	2
NPS 2 1/2	65	2 1/2
NPS 3	75	3
NPS 4	100	4
NPS 6	150	6

CONVERSION TABLE FOR LUBRICATION PIPING TUBING WALL THICKNESS	
METRIC (mm)	ENGLISH (inch)
2.1	0.083
0.9	0.035

CONVERSION TABLE FOR HOSE/TUBING SIZES O. D.	
METRIC (mm)	ENGLISH (inch)
6	1/4
10	3/8
13	1/2
16	5/8
19	3/4
22	7/8
25	1

CONVERSION TABLE FOR DRUM SIZES			
METRIC		ENGLISH	
L	kg	gallons	pounds
205	180	55	400
60	55	16	120
19	16	5	35

CONVERSION TABLE FOR POWER	
METRIC (kW)	ENGLISH (HP)
0.037	1/20
0.075	1/10
0.18	1/4
0.25	1/3
0.37	1/2
0.55	3/4
0.75	1
1.1	1 1/2
1.5	2
2.2	3
3.7	5
5.5	7 1/2
7.5	10
11	15
15	20
18.5	25
22	30
30	40
37	50
45	60
55	75
75	100
90	120
110	150

CONVERSION TABLE FOR IMPELLER BALANCE		
SYNCHRONOUS RPM	METRIC (g mm/kg)	ENGLISH (ounce- inch/pound)
720	94	0.059
900	73	0.046
1200	54	0.034
1800	41	0.026
3600	17	0.011

CONVERSION TABLE FOR ELECTRICAL CONDUIT	
METRIC SIZE SHOWN ON THE PLANS mm	EQUIVALENT IMPERIAL SIZE inch
16	1/2
21	3/4
27	1
35	1 1/4
41	1 1/2
53	2
103	4

SECTION 12-2. SITEWORK

12-2.01 EARTHWORK FOR BUILDING WORK

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of performing earthwork for building work in accordance with the details shown on the plans and these special provisions.

Earthwork for building work shall consist of structure excavation and structure backfill. Structure excavation shall include excavation for footings, foundations, slabs, and trenches. Structure backfill shall include backfilling under slabs; backfilling under and around footings; backfilling for conduits. In addition to structure excavation and structure backfill, earthwork for building work shall include any other earthwork, not mentioned, but necessary to complete the building work.

QUALITY ASSURANCE.--

Samples.--Samples of sand weighing not less than 11 kg, shall be submitted to the Engineer at the jobsite for approval.

SITE CONDITIONS.--

Existing surfaced or planted areas.--Existing surfaced or planted areas that are removed, broken or damaged by the Contractor's operations shall be restored to their original condition except as otherwise shown on the plans or specified herein.

Restoration materials shall be equal to or better than the original materials. Surfacing shall be replaced to match the material thickness, grades, and finish of the adjacent surrounding surfaces.

PART 2.- PRODUCTS

BACKFILL MATERIALS.--

Structure backfill.--

Structure and trench backfill shall be free of organic and other deleterious material and shall be suitable for the required compaction. Gravel without sand matrix shall not be used except as free draining granular material beneath slabs and footings.

Sand.--

Sand shall be clean, washed sand, free from clay or organic material graded such that 100 percent passes the 6 mm sieve, 90 percent to 100 percent passes the 4.75 mm sieve and not more than 5 percent passes the 75 μ m sieve size.

PART 3.- EXECUTION

STRUCTURE EXCAVATION.--

General.--Unless otherwise noted, all excavation for building work shall be classified as structure excavation.

Footing excavation.--The bottom of excavation shall not be disturbed. The contractor shall excavate by hand to the final grade. The bottom of concrete footings shall be poured against undisturbed material. Unless otherwise noted, compaction of the bottom of footing excavation is not required unless the material is disturbed. The footing depths shown on the plans shall be changed to suit field conditions when directed by the Engineer. Solid rock at or near required depths shall not be disturbed. Unsuitable material shall be excavated down to firm bearing as directed by the Engineer. Work and materials required because of excavation in excess of the depths shown on the plans, when such excavation has been ordered by the Engineer, will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

Excavate to the elevations and dimensions within a tolerance of ± 12 mm. Limits of the excavation shall allow for adequate working space for installing materials and as required for safety of personnel. Such working space excavation shall be replaced in kind and compacted at the Contractor's expense.

Overdepth excavation for footings shall be backfilled with concrete or such other material recommended by the Contractor and approved by the Engineer. Relative compaction shall be not less than 95 percent.

Excavation for conduits.--Conduits shall have not less than 0.75 meter of cover from top of pipes or conduits to finished grade unless otherwise shown on the plans or specified.

Trenching shall be of sufficient depth to permit placing a minimum depth of 150 mm of compacted sand under all conduits.

Dewatering.--Excavations shall be kept clear of standing water. Water shall be removed by pumping if necessary. Water removed from excavation shall be carried away from the building site and disposed of in a manner that will not harm State or adjacent property.

STRUCTURE BACKFILLING.--

General.--Unless otherwise noted, all backfill for building work shall be classified as structure backfill. Backfill shall be placed and compacted in horizontal layers, not more than 150 mm thick prior to compaction, and to the lines and grades shown on the plans or to original ground.

Structure backfill.--After structures are in place and forms are removed, wood and other debris shall be removed from excavations before placing structure backfill.

Unless approved in writing by the Engineer, compaction of structure or select backfill by jetting or ponding will not be permitted.

Backfilling conduits.--Backfill placed under conduits shall be compacted sand, 100 mm minimum depth. Backfill material placed to a level 150 mm above tops of conduits shall be sand. Backfill material placed higher than 150 mm above tops of pipes or conduits shall consist of material free of stones or lumps exceeding 100 mm in greatest dimension except:

COMPACTION.--

General.--Relative compaction shall be determined in accordance with California Test 216 or 231.

Unless otherwise noted below, all backfill shall be compacted to a minimum relative compaction of 90 percent.

Compact original ground.--Original ground surface under fill with surfacing of concrete and asphalt concrete shall be compacted to a relative compaction of not less than 95 percent for a minimum depth of 150 mm.

Subgrade preparation.--Preparation of subgrade material for placing slabs thereon shall include fine grading, compaction, reworking as necessary. The upper 150 mm of the subgrade shall have the same compaction as the fill to be placed over it.

The prism of backfill directly underneath the building foundation and sloping downward at 1:1 shall be compacted to 95 percent.

Structure backfill.--Structure backfill shall be compacted to not less than 95 percent relative compaction.

Trench backfill.--Trench backfill placed beneath slabs or paved areas shall be compacted to a relative compaction of not less than 95 percent.

DISPOSAL.--

Surplus material.--Surplus material from the excavation shall be removed and disposed of outside the right-of-way in accordance with Section 7-1.13 of the Standard Specifications.

FIELD QUALITY CONTROL.--

Inspection.--When the excavation is substantially completed to grade, the Contractor shall notify the Engineer. No concrete shall be placed until the foundation has been approved by the Engineer.

Testing.--The State will conduct compaction tests during the backfilling and compacting operations.

12-2.02 FREE DRAINING GRANULAR MATERIAL

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and placing free draining granular material beneath slabs in accordance with the details shown on the plans and these special provisions.

PART 2.- PRODUCTS

Free draining granular material.--

Free draining granular material shall be clean, hard, durable, free-draining rock. The material gradation shall be such that all passes the 25 mm screen, and not more than 5 percent passes the 4.75 mm sieve as determined by California Test 202. Granular material shall be free from organic material, clay balls or other deleterious substances.

PART 3.- EXECUTION.--

SPREADING AND CONSOLIDATING.--

General.--Free draining granular material shall be placed, spread and consolidated by tamping or vibrating.

SECTION 12-3. CONCRETE AND REINFORCEMENT

12-3.01 CAST-IN-PLACE CONCRETE

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of constructing cast-in-place concrete facilities in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data for admixtures, expansion joint material, vapor barrier, hardener, and sealer shall be submitted for approval.

Descriptive data shall be delivered to the Engineer at the jobsite.

QUALITY ASSURANCE.--

Certificates of Compliance.--Certificates of Compliance shall be furnished for cement, reinforcement, and admixtures in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

A Certificate of Compliance shall be furnished for each shipment of epoxy-coated reinforcing bars certifying that the coated bars conform to the requirements of ASTM Designation: D 3963. Said Certificate of Compliance shall include all certifications specified in ASTM Designation: D 3963 and a statement that the coating material has been prequalified by

acceptance testing performed by the National Bureau of Standards or by the Valley Forge Laboratories, Inc., Devon, Pennsylvania.

PART 2.- PRODUCTS

CONCRETE MIXES.--

Concrete (structural work).--

Commercial quality concrete shall be proportioned to provide a workable mix suitable for the intended use; shall have not less than 350 kg/m³ of cement; 0 to 50 mm penetration, inclusive, as determined by California Test 533.

Concrete (minor work).--

Commercial quality concrete for concrete landings shall be proportioned to provide a workable mix suitable for the intended use; shall have not less than 300 kg/m³ of cement; 0 to 50 mm penetration, inclusive, as determined by California Test 533.

CONCRETE MATERIALS.--

Cement.--

Cement shall conform to ASTM Designation: C 150, Types II, or III portland cement; or Type IP (MS) Modified cement. Type IP (MS) Modified shall conform to ASTM Designation: C 595 and shall be comprised of an intimate mixture of Type II Modified cement and not more than 20 percent of a pozzolanic material.

Aggregates.--

Aggregates shall be free from deleterious coatings, clay balls and other extraneous materials.

Admixtures.--

Admixtures used in portland cement concrete shall be included on the Department's current list of approved admixtures, and shall conform to ASTM Designation: C 494, Types A, B, D, F or G for chemical admixtures; ASTM Designation: C 260 for air-entraining admixtures; and ASTM Designation: C 618 for mineral admixtures, except loss on ignition shall not exceed 4 percent. Properties of admixtures shall be uniform in each lot.

FORM MATERIALS.--

Forms for exposed finish concrete.--

Forms for exposed surfaces shall be plywood, metal or other panel type materials. Plywood shall be not less than 16 mm thick and without scars, dents, and delaminations. Forms shall be furnished in largest practical pieces to minimize number of joints.

Plywood shall conform to the requirements of U. S. Product Standard PS-1 for Exterior Medium Density Overlay plywood.

Forms for edges of slabs shall be nominal 50 mm solid stock lumber, plywood, or metal forms.

Forms for unexposed finish concrete.--

Forms for unexposed finish concrete surfaces shall be plywood, lumber, metal or other acceptable material.

Form ties.--

Form ties shall be factory fabricated, removable or snapoff metal ties for use as necessary to prevent spreading of forms during concrete placement.

Form oil.--

Form oil shall be commercial quality form oil which will permit the ready release of the forms and will not discolor the concrete.

REINFORCING MATERIALS.--

Bar reinforcement.--

Bar reinforcement shall conform to ASTM Designation: A 615/A 615M, Grade 60 [420], or ASTM Designation: A 706/A 706M.

Epoxy coated reinforcement.--

Bar supports.--

Bar supports for reinforcement shall be precast mortar blocks or ferrous metal chairs, spacers, metal hangers, supporting wires, and other approved devices of sufficient strength to resist crushing under applied loads.

Mortar.--

Mortar shall consist of one part cement to 2 parts clean sand and only enough water to permit placing and packing.

Curing compound.--

Curing compound shall be a non-pigmented curing compound with fugitive dye conforming to the requirements of ASTM Designation: C 309, Type 1-D, Class A.

ADMIXTURES.--

General.--Admixtures shall be used when specified or ordered by the Engineer and may be used at the Contractor's option to conserve cement or to facilitate any construction operation.

Calcium chloride shall not be used in any concrete.

Admixtures shall be combined with concrete materials by methods that produce uniform properties throughout the concrete.

If more than one admixture is used, said admixtures shall be compatible with each other so that the desirable effects of all admixtures will be realized.

Mineral admixtures may be used to replace up to 15 percent of Type II portland cement provided the weight of mineral admixture used is not less than the weight of cement replaced. Mineral admixtures shall not be used to replace Type IP (MS) Modified or Type III cements. Chemical admixtures may be used to reduce up to 5 percent of the portland cement except that the cement content shall not be less than 300 kg/m³. When both chemical and mineral admixtures are used with Type II cement, the weight of cement replaced by mineral admixture may be considered as cement in determining the resulting cement content.

Mineral admixtures will be required in the manufacture of concrete containing aggregates that are determined to be "deleterious" or "potentially deleterious" when tested in accordance with ASTM Designation: C 289. The use of mineral admixture in such concrete shall conform to the requirements in this section except that the use of set retarding admixtures will not be permitted.

When the use of a chemical admixture is specified or is ordered by the Engineer, the admixture shall be used at the rate specified or ordered. If no rate is specified or ordered, or if the Contractor uses a chemical admixture for his own convenience, the admixture shall be used at the dosage normally recommended by the admixture manufacturer.

When air-entrainment is specified or is ordered by the Engineer, the air-entraining admixture shall be used in amounts to produce concrete having the specified or ordered air content as determined by California Test 504. If the Contractor uses air-entrainment for his own convenience, the average air content shall not exceed 4 percent and no single test shall exceed 5 1/2 percent.

Chemical admixtures and air-entraining admixtures shall be dispensed in liquid form. Dispensers shall have sufficient capacity to measure at one time the total quantity required for each batch. If more than one liquid admixture is used in the concrete, a separate measuring unit shall be provided for each liquid admixture and dispensing shall be such that the admixtures are not mixed at high concentrations. When air-entraining admixtures are used with other liquid admixtures, the air-entraining admixtures shall be the first to be incorporated into the mix. Unless liquid admixtures are added to premeasured water for the batch, they shall be discharged to flow into the stream of water so that the admixtures are well dispersed throughout the batch.

BAR REINFORCING STEEL.--

Bending.--Reinforcing steel bars shall accurately conform to the dimensions shown on the plans.

Bars shall be bent or straightened in a manner that will not crack or break the material. Bars with kinks or improper bends shall not be used.

Hooks, bends and splices shall conform to the provisions of the Building Code Requirements for Reinforced Concrete of the American Concrete Institute.

MIXING AND TRANSPORTING CONCRETE.--

General.--When a truck mixer or agitator is used for transporting concrete to the delivery point, discharge shall be complete within 1 1/2 hours, or before 250 revolutions of the drum or blades, whichever comes first, after the introduction of cement to the aggregates.

Truck mixers or agitator shall be equipped with electrically or mechanically actuated revolution counters by which the number of revolutions of the drum or blades may readily be verified. The counters shall be of the continuous-registering type, which accurately register the number of revolutions and shall be mounted on the truck so that the Engineer may safely and conveniently inspect them from alongside the truck. Under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 30°C or above, a time less than 1 1/2 hours may be required.

When non-agitating hauling equipment is used for transporting concrete to the delivery point, discharge shall be complete within one hour after the introduction of cement to the aggregates. Under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 30°C, or above, the time between the introduction of cement to the aggregates and discharge shall not exceed 45 minutes.

Each load of concrete for the work shall be accompanied by a trip ticket, a copy of which shall be delivered to the Engineer at the jobsite. The trip ticket shall show volume of concrete, weight of cement and aggregates, quantity of each admixture, quantity of water including water added at the jobsite, time of day the concrete is batched, and revolution counter readings on transit mix trucks at the times the truck is charged and unloaded.

PART 3.- EXECUTION

PREPARATION.--

Existing concrete construction.--Where fresh concrete joins existing or previously placed concrete or masonry, the contact surfaces of the existing or previously placed material shall be roughened, cleaned, flushed with water and allowed to dry to a surface dry condition immediately prior to placing the fresh concrete. The roughened surface shall be no smoother than a wood trowelled surface. Cleaning of the contact surfaces shall remove laitance, curing compounds, debris, dirt and such other substances or materials which would prevent bonding of the fresh concrete.

Abrasive blast methods shall be used to clean horizontal construction joints to the extent that clean aggregate is exposed.

Exposed reinforcing steel located at the contact surfaces which is to be encased in the fresh concrete shall be cleaned to remove any substance or material that would prevent bonding of the fresh concrete.

Forms.--Forms shall be mortar tight, true to the dimensions, lines, and grades shown on the plans, securely fastened and supported, and of adequate rigidity to prevent distortion during placing of concrete.

Forms for exposed surfaces shall be constructed with triangular fillets not less than 19 mm x 19 mm attached so as to prevent mortar runs and to produce smooth straight chamfers at all sharp edges of the concrete.

Form fasteners shall be removable without chipping, spalling, heating or otherwise damaging the concrete surface. Form ties shall be removed to a depth of at least 25 mm below the surface of the concrete.

The inside surfaces of forms shall be cleaned of all dirt, mortar and foreign material. Forms shall be thoroughly coated with form oil prior to use.

Soffit forms and supports shall not be released or removed until at least 10 days after placing concrete. Other forms shall not be stripped until at least 40 hours after placing concrete.

Anchorages and embedded items shall be placed and rigidly secured at their planned locations prior to placing concrete.

Placing reinforcing steel.--Reinforcing steel bars shall be accurately placed to the dimensions shown on the plans.

Bar reinforcement conforming to ASTM Designation: A 615/A 615M, Grade 420, or A 706/A 706M shall be lapped at least 45 diameters.

Bars shall be firmly and securely held in position by means of wiring and approved bar supports. The spacing of supports and ties shall prevent displacement of the reinforcing or crushing of supports.

Tie wire shall be clear of concrete formwork and concrete surfaces.

All reinforcing steel shall be in place and inspected before concrete placement begins. Placing of bars on fresh layers of concrete will not be permitted.

Ground bar.--A continuous reinforcing steel bar shall be installed in the building foundation at the location indicated on the plans for the electrical ground bar. The use of epoxy coated reinforcing bar is not permitted. The end of the ground bar shall extend beyond the concrete surface and shall be protected from damage by construction operations.

PLACING CONCRETE.--

General.--Concrete shall be placed and consolidated by means of internal vibrators to form dense, homogeneous concrete free of voids and rock pockets.

Forms and subgrade shall be thoroughly moistened with water immediately before placing concrete.

Concrete shall be placed as nearly as possible to its final location and the use of vibrators for extensive shifting of the concrete will not be permitted.

Concrete shall be deposited and consolidated in a continuous operation within limits of construction joints, until the placing of the panel or section is completed.

When concrete is to be placed in large areas requiring more than two pours, concrete shall be placed in alternate long strips between construction joints and the final slab infilled.

FINISHING CONCRETE SURFACES.--

Finishing unformed surfaces.--Slabs shall be placed full thickness to finish elevation and leveled to screeds by use of long straightedges. The screeds shall be set to grade at approximately 1.8 meter centers. After leveling, screeds shall be removed and the surface shall be floated with wooden floats.

The floated surface shall be trowelled with steel trowels. Troweling shall form a dense, smooth and true finish. Landings for pedestrian traffic shall be given a non-slip broom finish unless a different finish is called for on the plans or in these special provisions.

The application of cement dust coat will not be permitted.

Finished surfaces of floor slabs shall not deviate more than 3 mm from the lower edge of a 3-meter long straight edge.

Finishing formed surfaces.--Formed concrete surfaces shall be finished by filling holes or depressions in the surface, repairing all rock pockets, and removing fins. All surfaces of formed concrete exposed to view shall have stains and discolorations removed, unsightly bulges removed, and all areas which do not exhibit the required smooth, even surface of uniform texture and appearance shall be sanded with power sanders or other approved abrasive means until smooth, even surfaces of uniform texture and appearance are obtained.

Cement mortar, patching and finishing materials used to finish exposed surfaces of concrete shall closely match the color of surrounding surfaces.

General.--Freshly placed concrete shall be protected from premature drying and excessive cold or hot temperatures.

Initial curing of floor slabs shall start as soon as free water has disappeared from the concrete surface. The concrete shall be kept continuously moist for not less than 7 days after the concrete has been placed.

Cotton mats, rugs, carpets, or sand blankets may be used as a curing medium to retain the moisture during the curing period. Curing materials that will stain or discolor concrete shall not be used on surfaces exposed to view.

Prior to placing the curing medium, the entire surface of the concrete shall be kept damp by applying water with a nozzle that so atomizes the flow that a mist and not a spray is formed, until the surface of the concrete is covered with the curing medium. At the expiration of the curing period, the concrete surfaces shall be cleared of all curing mediums.

Concrete surfaces, other than floor slabs, shall be kept moist for a period of at least 5 days by leaving the forms in place or by covering the exposed surfaces using moist rugs, cotton mats or other curing materials approved by the Engineer.

Concrete landings may be cured with a curing compound.

PROTECTING CONCRETE.--

General.--Concrete shall not be placed on frozen or frost covered surfaces.

Concrete shall be protected from damage due to rain, freezing or inclement weather, and shall be maintained at a temperature of not less than 4°C for 72 hours. When required by the Engineer, the Contractor shall provide a written outline of his proposed methods of protecting concrete.

Vehicles, equipment, or concentrated loads weighing more than 140 kg individually and material stockpiles weighing more than 240 kg/m² will not be permitted on the concrete within 10 calendar days after placing.

SECTION 12-4. BLANK)

SECTION 12-5. METALS

12-5.01 METAL FRAMING

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing metal framing, including steel studs in accordance with the details shown on the plans and these special provisions.

REFERENCES.--

Component design.--Structural properties of studs and joists shall be computed in accordance with American Iron and Steel Institute (AISI), "Specification for Designing of Cold-Formed Steel Structural Members."

Welding.--Welding shall be in accordance with American Welding Society (AWS) D1.3, "Structural Welding Code - Sheet Steel."

Welders shall be qualified in accordance with "Welder Qualification," procedures of AWS D1.1, "Structural Welding Code-Steel."

SUBMITTALS.--

Product data.--Manufacturer's descriptive data and installation instructions for each item of cold-formed metal framing and accessories shall be submitted for approval.

Installation instructions shall include instructions for securing studs to tracks and other framing connections.

Working drawings.--Working drawings and calculations for metal framing components not fully dimensioned in manufacturer's descriptive data shall be submitted for approval.

Working drawings shall include framing members showing size and gage designations, number, type, location and spacing. Working drawings shall include supplemental strapping, bracing, splices, bridging, accessories, and details required for proper installation.

QUALITY ASSURANCE.--

Fire-rated assemblies.--Where metal framing units are components of assemblies indicated to be fire-rated, provide units which have been approved for the rating indicated on the plans.

DELIVERY, STORAGE AND HANDLING.--

General.--Metal framing components shall be protected from rusting and damage. Components shall be delivered to the jobsite in manufacturer's unopened containers or bundles, fully identified with name, brand, type and grade. Components shall be stored off ground in a dry ventilated space.

PART 2.- PRODUCTS

METAL FRAMING.--

Studs.--

Framing components, shall be minimum 1.21 mm (18-gage) and shall be fabricated of commercial quality galvanized steel sheets with a minimum yield strength of 228 MPa; conforming to ASTM Designation: A 446M, Grade A.

Track.--

Track shall be formed steel, channel shape, and same width as studs; solid web; not less than 1.21 mm (18-gage) thickness.

ACCESSORIES.--

Fasteners.--

Fasteners shall be hot-dipped galvanized, self-drilling, self-tapping screws, or bolts, nuts and washers.

Anchorage.--

Anchorage shall be ICBO approved for the purpose intended, integral stud type, powder driven or drilled expansion bolts.

FINISHES.--

Studs, track and headers.--

Studs, tracks and headers shall be hot-dipped galvanized to conform to ASTM Designation: A 446M, G60.

Miscellaneous metal parts.--

Miscellaneous parts, including, bracing, furring, plates, gussets, and bridging, shall be hot dipped galvanized to not less than 381 kilograms per square meter.

FABRICATION.--

General.--Framing components shall be fabricated in place or prefabricated into panels to the maximum extent possible prior to erection. Panels shall be fabricated plumb, square, true to line and braced against racking with joints welded. Lifting of prefabricated panels shall be performed in a manner to prevent damage or distortion.

Panels shall be fabricated in jig or templates to hold members in proper alignment and position to assure accurate placement.

Fastenings.--Components shall be fastened by shop welding, bolting or screw fasteners as shown on the approved drawings.

PART 3.- EXECUTION

INSTALLATION.--

Studs.--Studs shall be erected plumb, except as needed for diagonal bracing or similar requirements. Channel tracks shall be aligned accurately to the wall layout at both floor and ceiling. Tracks shall be secured to floor and ceiling with fasteners spaced at not more than 406 mm intervals. Fasteners shall be provided at corners and ends of track.

Studs shall extend from floor to underside of ceiling except at wall openings. Each stud shall be secured to tracks at both top and bottom by bolting or screw fastening at both inside and outside flanges. Field welding shall not be permitted. A 12 mm clearance shall be provided at the top shoes. Door openings shall have double studs continuous across head and from floor to ceiling on each jamb.

Studs at openings shall be fastened solidly and securely to floor clips. Floor clips shall be fastened to the floor with 2 anchors unless otherwise shown on the plans.

12-5.02 BUILDING MISCELLANEOUS METAL

PART 1.- GENERAL

Scope.--This work shall consist of fabricating, furnishing and installing building miscellaneous metal in accordance with the details shown on the plans and these special provisions.

Building miscellaneous metal shall consist of the following:

Miscellaneous shapes
Checkered floor plates

including all anchors, fastenings, hardware, accessories and other supplementary parts necessary to complete the work.

REFERENCES.--

Codes and standards.--Welding of steel shall be in accordance with American Welding Society (AWS) D 1.1, "Structural Welding Code-Steel" and D 1.3, "Structural Welding Code-Sheet Steel."

SUBMITTALS.--

Product data.--Submit manufacturer's specifications, anchor details and installation instructions for products used in miscellaneous metal fabrications.

Working drawings.--Working drawings of fabricated items shall be submitted for approval.

QUALITY ASSURANCE.--

Shop assembly.--Preassemble items in shop to the greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark all units for reassembly and installation.

Inspection and tests.--Materials and fabrication procedures shall be subject to inspection and tests by the Engineer, in mill, shop and field. Such tests will not relieve the Contractor of responsibility of providing materials and fabrication procedures in compliance with specified requirements.

PART 2.- PRODUCTS

MATERIALS.--

Steel bars, plates and hot-rolled shapes.--

Steel bars, plates and hot-rolled shapes shall conform to ASTM Designation: A 36/A 36M.

Checkered floor plates.--

Checkered floor plates shall be commercial quality steel with standard raised pattern.

Expansion anchors.--

Expansion anchors shall be ICBO approved for the purpose intended, integral stud type anchor or internally threaded type with independent stud, hex nut and washer.

Powder driven anchors.--

Powder driven anchors shall be plated, spring steel alloy drive pin or threaded stud type anchors for use in concrete or steel. Spring steel shall conform to ASTM Designation: A 227M, Class 1. The diameter, length and type of shank and the number and type of washer shall be as recommended by the manufacturer for the types and thickness of material being anchored or fastened.

Workmanship and finish.--Workmanship and finish shall be equal to the best general practice in modern shops.

Miscellaneous metal shall be clean and free from loose mill scale, flake rust and rust pitting, and shall be well formed and finished to shape and size with sharp lines and angles. Bends from shearing or punching shall be straightened.

The thickness of metal and details of assembly and support shall give ample strength and stiffness.

Built-up parts shall be true to line and without sharp bends, twists and kinks. Exposed ends and edges of metal shall be milled or ground smooth, with corners slightly rounded.

Joints exposed to the weather shall be made up to exclude water.

Galvanizing.--Items indicated on the plans to be galvanized shall be hot-dip galvanized after fabrication. The weight of galvanized coating shall be at least 460 grams per square meter of surface area, except drainage grates shall have at least 610 grams per square meter of surface area.

PART 3.- EXECUTION

GENERAL.--

Anchorage.--Anchorage devices and fasteners shall be provided for securing miscellaneous metal in-place construction; including threaded fasteners for concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws and other connectors.

Cutting, drilling and fitting shall be performed as required for installation of miscellaneous metal fabrications. Work is to set accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels.

Powder driven anchors.--Powder driven anchors shall be installed with low velocity powder actuated equipment in accordance with the manufacturer's instructions and State and Federal OSHA regulations.

DAMAGED SURFACES.--

General.--Galvanized surfaces that are abraded or damaged at any time after the application of the zinc coating shall be repaired by thoroughly wire brushing the damaged areas and removing all loose and cracked coating, after which the clean areas shall be painted with 2 applications of unthinned zinc-rich primer (organic vehicle type). Aerosol cans shall not be used.

SECTION 12-6. WOOD AND PLASTICS

12-6.01 CARPENTRY

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing materials and performing carpentry work in accordance with the details shown on the plans and these special provisions.

DELIVERY, HANDLING AND STORAGE.--

Delivery and storage.--Materials shall be kept under cover and dry. All materials shall be protected from exposure to weather and contact with damp or wet surfaces with blocking and stickers. All lumber, plywood and other panels shall be stacked in such a manner to provide air circulation within and around the stacks.

PART 2.- PRODUCTS

PLYWOOD.--

General.--Plywood panels shall comply with Voluntary Product Standard PS 1, "U. S. Product Standard for Construction and Industrial Plywood." or American Plywood Association (APA), "Performance Standards and Policies for Structural Use Panels."

Each panel shall be factory marked with APA or other trademark evidencing compliance with grade requirements.

Structural plywood wall sheathing.--

Structural plywood wall sheathing shall be APA RATED SHEATHING, Exposure 1. Thickness shall be as shown on the plans.

MISCELLANEOUS MATERIALS.--

Rough Carpentry Hardware.--

Nails, screws, bolts, nuts, washers shall be commercial quality. Exposed fasteners shall be hot-dip galvanized, aluminum or stainless steel.

Joist hangers, clips and other standard framing hardware shall be ICBO approved, commercial quality, galvanized sheet steel or hot-dip galvanized, of the size shown on the plans.

Expansion anchors and powder driven anchors shall be as specified under "Building Miscellaneous Metal," in Section 12-5, "Metals," of these special provisions.

WOOD TREATMENT BY PRESSURE PROCESS.--

Preservative treatment.--

Preservative treatment shall be copper naphthenate, pentachlorophenol or water-borne arsenicals (ACA, CCA or ACZA).

All holes, daps and cut ends of treated lumber shall be thoroughly swabbed with 2 applications of copper naphthenate.

PART 3.- EXECUTION

INSTALLATION.--

Wood framing.--Wood framing shall be accurately cut and assembled to provide closely fitted members. Framing shall be erected true to the lines and grades shown on the plans and shall be rigidly secured in place as shown and as required by recognized standards. Bracing shall be placed wherever necessary to support all loads on the structure during erection.

Nailing schedule shall be as shown on the plans.

Plywood panels.--Panels shall be nailed to the framing system as shown on the plans.

Ceiling sheathing shall be installed with the long dimension across the supports and shall be continuous over 2 or more supports. End joints shall be staggered 1.2 m.

Wall sheathing shall have all edges blocked.

Spacing between panels shall be 3 mm.

SECTION 12-7. THERMAL AND MOISTURE PROTECTION

12-7.01 RIGID WALL INSULATION

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing rigid wall insulation in accordance with the details shown on the plans and these special provisions.

Rigid insulation shall include rigid insulation, wood nailers, fasteners and such other materials, not mentioned, which are required for the complete installation of the rigid insulation system.

QUALITY ASSURANCE.--

Codes and standards.--Rigid foam insulation shall have a flame-spread rating not to exceed 75 and a smoke density not to exceed 450 when tested in accordance with UBC Standard No. 8-1. Rigid foam insulation shall be approved in accordance with UBC Standard 26-3 to be installed without a thermal barrier on the room side of the insulation.

PART 2.- PRODUCTS

Rigid insulation.--

Rigid insulation shall be rigid rectangular boards of polyisocyanurate foam with aluminum foil facing on both sides and an aged thermal resistance of $R-1.9 \text{ K} \cdot \text{m}^2/\text{W}$.

Wood nailers.--

Wood nailers shall be Douglas fir, Hem-fir or equivalent western softwood. Nailers in contact with concrete shall be pressure treated after fabrication. Wood preservatives shall be waterborne type.

Insulation tape.--

Insulation tape shall be as recommended by the insulation manufacturer.

Adhesive.--

Adhesive shall be construction grade panel adhesive as recommended by the insulation manufacturer.

Fasteners.--

Fasteners shall be concrete nails; Bostich, Pneumatic Nail System; Buildex, Tampcon Fasteners; or equal.

EXECUTION.--

Installation of rigid insulation--The preparation of the wall surfaces and the installation of insulation shall conform to the manufacturer's recommendations and these special provisions.

Rigid insulation placed behind fiberglass reinforced plastic (FRP) panels shall be tight fitting between 38 mm x 89 mm wood nailers laid flat and spaced 0.6 meter on center. Wood nailers shall also be placed at the top and bottom of the plywood or gypsum board.

All joints between insulation boards and between insulation boards and wood nailers shall be taped.

Insulation panels with broken or crushed corners or edges shall be trimmed free of such defects or shall be discarded. Replacement boards less than 300 mm wide shall not be used.

Damaged insulation in the completed work shall be removed and replaced. Insulation that has been wet or is wet shall be considered damaged.

12-7.02 TORCH APPLIED ROOFING

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing a torch applied roof covering system in accordance with the details shown on the plans and these special provisions.

Torch applied roofing system shall have a granular surfacing, and shall include all materials for constructing the roofing system complete and in place.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data and installation instructions for torch applied roofing system shall be submitted for approval.

QUALITY ASSURANCE.--

Codes and standards.--Roofing materials shall conform to the rules for control of volatile organic emissions adopted by the local air pollution control district having jurisdiction in the area.

Field samples.--Materials shall be delivered to the jobsite in labeled containers or wrappings sufficiently ahead of their intended use to allow sampling and testing by the Engineer.

DELIVERY AND HANDLING.--

Storage.--Stored or stockpiled roof roofing shall be set on end and shall be protected from the elements. Roofing rolls compressed into oval cross section shall not be used.

PART 2.- PRODUCTS

Torch applied roofing and flashing.--

Torch applied roofing shall be Class A or B fire retardant plastic bituminous roofing membrane. Plasticized bituminous compound, consisting of distilled asphalt mixed with polypropylene and petrochemical woven around a nonwoven polyester core.

Flashing rolls shall be properly sized for the application intended.

Top surface shall be embedded with slate flakes or mineral granules as follows:

4 mm smooth--- For torch applied roofing on curved surfaces.

4.5mm granular---- For torch applied roofing on flat surfaces.

Primer.--

Primer for torch applied roofing shall be a water-based asphalt primer.for application for metal surfaces.

PART 3.- EXECUTION

PREPARATION.--

General.--Surfaces to be covered shall be smooth, hard, dry and shall be free from high spots, depressions, frost or defects from frost, dust loosened material or other debris.

Openings, holes or crevices shall be filled or covered before any roofing materials are applied.

INSTALLATION.--

Application.--Torch applied roofing shall be installed to provide a watertight, non-leaking roof covering in accordance with the manufacturer's recommendations.

Torch applied roofing work and work of other trades shall be coordinated and scheduled to minimize interference and to eliminate traffic on the completed roof.

Torch applied roofing and roofing materials shall not be applied in wet weather or when ambient temperature is below 50° F. All drainage fixtures shall be set at the proper level to permit the free flow of water.

Primer shall be applied in a thin, continuous, uniform coating without skips or dry spots.

Flashing.--Flashings shall be installed as the roofing progresses to protect new facilities from damage resulting from rain, wind and storms. Any damage resulting from rain, wind or storms shall be corrected at the Contractors expense.

Torch applied flashings shall be placed after roofing is placed unless otherwise shown on the plans.

Torch applied flashings shall be one layer of flashing applied to metal substrate free of voids, fish mouths and wrinkles. No splices will be permitted.

CLEANUP.--

General.--Upon completion of the work, the Contractor shall clean all exposed surfaces that are subject to spillage, over run and marking by torch applied roofing. Clean up methods and materials shall be as recommended by the manufacturer.

Cleanup methods shall not damage, discolor or otherwise affect the exposed surfaces.

12-7.03 SHEET METAL FLASHING

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of fabricating, furnishing and installing sheet metal flashing in accordance with the details shown on the plans and these special provisions.

Sheet metal shall include metal flashings, counterflashings and roof jacks.

QUALITY ASSURANCE.--

Codes and standards.--Sheet metal work shall in accordance with the requirements in the latest edition of the Sheet Metal and Air Conditioning Contractors National Association "Standard Practice in Architectural Sheet Metal Work."

PART 2.- PRODUCTS

MATERIALS.--

Galvanized sheet steel.--

Galvanized sheet steel shall conform to ASTM Designation: A 361, not less than 0.71 mm (24-gage), unless otherwise shown on the plans. Surfaces to be painted shall not have factory coatings on galvanizing that cannot be removed by paint thinner.

Solder.--

Solder shall conform to ASTM Designation: B 32, Alloy Grade Sn50.

Soldering flux.--

Soldering flux shall be acid type, conforming to Federal Specification: O-F-506C, Type I, Form A.

Lap joint sealant.--

Lap joint sealant for concealed locations shall be a non-drying butyl.

Flashing cement.--

Flashing cement shall be a bituminous plastic cement, asbestos free, conforming to ASTM Designation: D 4586, Type II.

Sealant.--

Sealant for exposed locations shall be a silicone sealant conforming to ASTM Designation: C 920.

Primer.--

Primer shall be as recommended by the sealant manufacturer.

Coal tar paint.--**FABRICATION.--**

General.--Sheet metal shall be assembled to Sheet Metal and Air Conditioning Contractors National Association Standards.

Sheet metal shall be formed to the sizes, shapes and dimensions shown on the plans or as specified herein with angles and lines straight, sharp and in true alignment. The number of joints shall be kept to a minimum.

Angle bends and folds for interlocking the metal shall be made with full regard for expansion and contraction to avoid buckling or fullness in the metal after it is installed.

Joints in sheet metal work shall be closed watertight unless slip joints are specifically required. Watertight joints shall be mechanically interlocked and then thoroughly soldered for metals other than aluminum.

Sheet metal joints to be soldered shall be cleaned with steel wool or other means, pre-tinned and soldered watertight.

All joints shall be wiped clean of flux after soldering. Acid flux shall be neutralized by washing the joints with sodium bicarbonate.

Flashings shall have a 45 degree drip return at bottom edges. Unless otherwise shown on the plans, counterflashing shall extend not less than 100 mm over roofing or other materials protected by the counterflashing and shall be arranged so that roofing or materials can be repaired without damage to the counterflashing. Where reglets are indicated, counterflashing shall be fastened by lead wedges or snap-in flashing.

PART 3.- EXECUTION

PREPARATION.--Surfaces to receive sheet metal shall be clean, smooth and free from defects.

PROTECTION.--Aluminum surfaces to be in contact with concrete, mortar, or dissimilar metals shall be given a heavy coat of coal tar paint.

INSTALLATION.--

Roof penetration flashings.--All pipes, ducts, vents and flues passing through roofs shall be made waterproof with flashings of storm collars or counterflashings.

Roof penetration flashings shall be fabricated from galvanized sheet steel, not less than 0.71 mm (24-gage). Size and shape shall be as shown on the plans.

12-7.04 SEALANTS AND CAULKING

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and applying sealants and caulking which are required for this project, but not specified elsewhere, in accordance with the details shown on the plans and these special provisions.

QUALITY ASSURANCE.--

Certificates of Compliance.--Certificates of compliance shall be furnished for the sealants and caulking in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data and installation instructions for all sealants shall be submitted for approval.

Samples.--Color samples of all sealants shall be submitted for approval. Unless otherwise shown on the plans, colors will be selected by the Engineer from the manufacturer's standard colors.

PART 2.- PRODUCTS

MATERIALS.--

General.--All sealants, primers and accessories shall be non-staining to adjacent exposed surfaces. Products having similar applications and usage shall be of the same type and same manufacturer. Gun consistency compound shall be used unless otherwise required by the job conditions.

Acrylic sealant.--

Acrylic sealant shall be one compound, solvent release acrylic sealant.

Butyl sealant.--

Butyl sealant shall be one component, skinning type.

Silicone sealant.--

Silicone sealant shall be one component, low modulus building sealant. Sealant shall be tack-free in one hour, shall not sag or flow, shall be ozone resistant and capable of 100 percent extension without failure.

Joint sealant.--

Joint sealant shall be a two-part, non sag polysulfide base, synthetic rubber sealant formulated from liquid polysulfide polymer.

Backer rod.--

Backer rod shall be round, open or closed cell polyurethane. Backer rod shall be sized such that it must be compressed between 25 and 75 percent of its uncompressed diameter during installation in the joint.

Neoprene.--

Neoprene shall conform to the requirements of ASTM Designation: C 542.

PART 3.- EXECUTION

APPLICATION.--

General.--Unless otherwise shown on the plans, sealants shall be applied in accordance with the manufacturer's instructions.

Silicone sealants shall not be used in locations where painting is required.

Butyl sealants shall not be used in exterior applications, and acrylic sealants shall not be used in interior applications.

Sealants shall be applied in a continuous operation for the full length of the joint. Immediately following the application of the sealant, the sealant shall be tooled smooth using a tool similar to that used to produce concave masonry joints. Following tooling, the sealant shall remain undisturbed for not less than 48 hours.

SECTION 12-8. DOORS AND WINDOWS

12-8.01 HINGED DOORS

GENERAL.--This work shall consist of furnishing and installing hinged doors and frames in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--Manufacturer's descriptive data, installation instructions for fire rated assemblies and a door schedule shall be submitted for approval. The door schedule shall include a description of the type, location and size of each door and frame.

PRODUCTS.--

Wood door.--

Metal door.--

Metal door shall be flush, seamless steel door factory prepared and reinforced to receive hardware and having cold rolled stretcher leveled sheet steel face sheets not less than 1.2 mm thick (18-gage). Face sheets shall be bonded with thermosetting adhesive to rigid board honeycomb or precured foam core; or face sheets shall be welded to all parts of an assembled grid of cold formed pressed metal stiffeners and framing members located around edges, ends, openings and at all locations necessary to prevent buckling of face sheets. Seams shall be tack welded, filled and ground smooth. Bottom edge and internal stiffeners of grid type core shall have moisture vents. Welds on exposed surfaces shall be ground smooth. Louvered or glazed openings shall be provided where shown on the plans.

Door shall be cleaned and treated by the bonderized process or approved phosphatizing process and then given one factory application of metal protective rust inhibitive primer. Primer shall not contain lead type pigments.

Door louvers.--

Door louvers shall be inverted V-type factory primed, galvanized sheet steel louvers. Exterior door louvers shall not be removable from outside of the building. Louvers at exterior doors shall have inside mounted bronze insect screens.

Pressed metal frame.--

Pressed metal frame shall be not less than 1.5 mm thick (16-gage) sheet steel with integral stop, mitered corners, face welded and ground smooth corners. Frames shall be reinforced for all hardware and shall be cleaned and treated by the bonderized process or an approved phosphatizing process and then given one factory application of metal protective rust inhibitive primer. Primer shall not contain lead type pigments.

Frames for fire rated doors shall be listed for the same rating shown on the plans for fire rated doors.

Sealants.--

Sealants shall be ultraviolet and ozone resistant, gun grade polysulfide or polyurethane, multicomponent, Federal Specification: TT-S-227.

EXECUTION.--

INSTALLATION.--Doors and frames shall be installed rigidly, securely, plumb and true and in such a manner that the doors operate freely without rubbing or binding. Clearance between frame and door shall be not more than 3 mm. The exterior frame shall be sealed weathertight.

Pressed metal frames shall be secured with clips and anchors as shown on the plans.

PAINTING.--Except for the primer application specified herein, doors and frames shall be cleaned, prepared and painted in accordance with the requirements specified under "Painting" in Section 12-9, "Finishes," of these special provisions.

12-8.02 FINISH HARDWARE

GENERAL.--This work shall consist of furnishing and installing hardware items for doors in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--Manufacturer's technical information and catalog cuts for each item of door hardware and a door hardware schedule shall be submitted for approval prior to installation.

Manufacturer's catalog cuts shall include catalog numbers, material, grade, type, size, function, design, quality and finish of hardware.

The door hardware schedule shall indicate the location and size of door opening, the door and frame material, and the size, style, finish and quantity of the hardware components required.

FINISHES.--Hardware shall be provided with standard US 26D metal plated finish.

KEYING INSTRUCTIONS.—Padlocks for door locks shall be keyed to the electrical maintenance personnel requirements.

Key bows shall be stamped "State of California" and "Do Not Duplicate."

PRODUCTS.--

GENERAL.--Door hardware equal in material, grade, type, size, function, design, quality and manufacture to that specified herein may be submitted for approval.

Butt hinges.--

Butt hinges shall be steel, 1 1/2-pair per door unless otherwise specified or shown on the plans. Nonremovable pins shall be provided at outswing exterior doors. Hinge size shall be 114 mm x 114 mm unless otherwise noted.

Heavy weight hinges shall be:

Hager	BB 1168
McKinney	T4B 37869
Stanley	BB 168
or equal.	

Dummy knob.--

Dummy knob shall act as act as pull only, no operation.

Dummy knob shall be:

Corbin Russwin	CK4250
Schlage	MD170/ME170
or equal.	

Security slide bolt.--

Security slide bolt shall have plate that covers padlock when it is locked, preventing shackle from being cut. Security slide bolt shall be equipped with padlock.

Security slide bolt shall be:

McMaster-Carr	1086A11
or equal.	

Door chain bolt.--

Door chain bolt shall be mounted at the top of the inactive leaf of double doors. Door chain bolt shall be approximately 200 mm long with a 600 mm chain. Door chain bolt shall have a spring that automatically releases the bolt when the chain is released.

Door chain bolt shall be:

McMaster-Carr	1437A50
or equal.	

Foot door bolt.--

Foot door bolt shall be mounted at the bottom of the inactive leaf of double doors. Foot door bolt shall be approximately 200 mm long and be operated by foot pressure.

Foot door bolt shall be:

McMaster-Carr	1436A5
or equal.	

Door closers.--

Parallel arms for closers with hold-open feature shall be installed at outswing exterior doors. Closers shall have sprayed finish to match other hardware on door.

Door closers shall be:

Corbin
Russwin
or equal.

Kickplates.--

Kickplates shall be 254 mm in height x 51 mm less than door width x 1.52 mm (16-gage).

Kickplates shall be:

Builders Brass	37
Quality	48
Trimco	6000
or equal.	

Rain drips, door sweeps and door shoes.--

Rain drips, door sweeps and door shoes shall conform to the sizes and configurations shown on plans.

Rain drip, door sweep and door shoe manufacturers shall be Pemko, Reese, Zero, or equal.

Weatherstrip

Weatherstrip shall conform to the sizes and shapes shown on plans. Assemblies shall be UL listed and shall be provided where shown on the plans or as specified in these special provisions.

Weatherstrip manufacturers shall be Pemko, Reese, Zero, or equal.

EXECUTION.--

DOORS AND FRAMES.--Doors and frames shall be set square and plumb and be properly prepared before the installation of hardware.

INSTALLATION.--Hardware items shall be accurately fitted, securely applied, and adjusted and lubricated in accordance with the manufacturer's instructions. Installation shall provide proper operation without bind or excessive play.

Hinges shall be installed at equal spacing with the center of the end hinges not more than 244 mm from the top and bottom of the door. Security slide bolts shall be 1024 mm from the finished floor. Kickplates shall be mounted on the push side of the doors, 25 mm clear of door edges.

Door controls shall be set so that the effort required to operate doors with closers shall not exceed 3.9 kg maximum for exterior doors and 2.7 kg maximum for interior doors. The effort required to operate fire doors may be increased above the values shown for exterior and interior doors but shall not exceed 6.8 kg maximum.

The location and inscriptions for door signs and name plates shall be as shown on the plans.

Hardware, except hinges, shall be removed from surfaces to be painted before painting.

Upon completion of installation and adjustment, the Contractor shall deliver to the Engineer all dogging keys, closer valve keys, lock spanner wrenches, and other factory furnished installation aids, instructions and maintenance guides.

DOOR HARDWARE GROUPS AND SCHEDULE.--Hardware groups specified herein shall correspond to those shown on the plans:

GROUP 1 (at double doors)

- 3-pair butt hinges
- 2 each dummy knob
- 1 each door closer
- 2 each weatherstrip
- 2 each kickplate
- 1 each security slide bolt
- 1 each door chain bolt
- 1 each floor foot bolt

GROUP 2 (at single doors)

- 1 1/2-pair butt hinges
- 1 each dummy knob
- 1 each door closer
- 1 each weatherstrip
- 1 each kickplate
- 1 each security slide bolt

SECTION 12-9. FINISHES

12-9.01 PAINTING

GENERAL.--This work shall consist of preparing surfaces to receive coatings, and furnishing and applying coatings, in accordance with the schedules and details shown on the plans, and these special provisions.

The coatings specified in this section are in addition to any factory finishes, shop priming, or surface treatment specified elsewhere in these special provisions.

SUBMITTALS.--Manufacturer's descriptive data, a materials list, and color samples shall be submitted for approval.

Product descriptive data shall include product description, manufacturer's recommendations for product mixing, thinning, tinting, handling, site environmental requirements, product application and drying time.

Materials list shall include manufacturer's name, trade name, and product numbers for each type coating to be applied.

Color samples shall be manufacturer's color cards, approximately 50 mm x 75 mm, for each color of coating shown on the plans. Color samples for stains shall be submitted on wood of the same species, color, and texture as the wood to receive the stain.

REGULATORY REQUIREMENTS.--Coatings and applications shall conform to the rules for control of volatile organic compound emissions adopted by the air quality control district in the air basin in which the coatings are applied.

SITE ENVIRONMENTAL REQUIREMENTS.--Coatings shall not be applied when the air temperature is below 10°C (20°C for varnishes) or when the relative humidity exceeds 75 percent.

The surface to be coated shall be maintained at a minimum temperature of 7°C for a period of 24 hours prior to, and 48 hours after the application of the coating. Heating facilities shall be provided when necessary.

Continuous ventilation shall be provided during application of the coatings.

A minimum lighting level of 865 lux, measured 1 m from the surface to be coated, shall be provided while surfaces are being prepared for coatings and during coating applications.

DELIVERY, STORAGE, AND HANDLING.--Products shall be delivered to the site in sealed, labeled containers and stored in a well ventilated area at an ambient air temperature of not less than 7°C. Container labeling shall include manufacturer's name, type of coating, trade name, color designation, drying time, and instructions for tinting, mixing, and thinning.

MAINTENANCE STOCK.--Upon completion of coating work, a full 3.8 liter container of each type and color of finish coat and stain used shall be delivered to the location at the project site designated by the Engineer. Containers shall be tightly sealed and labeled with color, texture, and room locations where used, in addition to the manufacturer's standard product label.

PRODUCTS.--

GENERAL.--The products shall be the best quality grade coatings of the specified types as regularly manufactured by nationally recognized paint and varnish manufacturers that have not less than 10 years experience in manufacturing paints and varnishes. Products that do not bear the manufacturer's identification as the best quality grade product shall not be used. Products for each coating system shall be by a single manufacturer and shall not contain lead type pigments.

Thinners, shellac, fillers, patching compounds, coloring tint, and other products required to achieve the specified finish shall be the manufacturer's best quality and shall be used as recommended.

EXECUTION.--

INSPECTION.--Surfaces to be coated at the jobsite shall be approved by the Engineer prior to the application of coatings. The Contractor shall notify the Engineer at least 3 working days prior to the application of coatings.

SURFACE PREPARATION.--Surfaces scheduled to be coated shall be prepared in accordance with the following, except that the surfaces not specified herein shall be prepared as recommended by the coating manufacturer.

GENERAL.--Hardware, cover plates, light fixture trim, and similar items shall be removed prior to preparing surfaces for coating. Following the application of the finish coating, the removed items shall be reinstalled in their original locations.

GALVANIZED METAL.--Oils, grease, and fabrication lubricants shall be removed by solvent wash. Surfaces shall be cleaned of remaining surface treatments by hand cleaning. New surfaces shall be roughened by hand cleaning or light abrasive blasting.

Abraded or corroded areas shall be hand cleaned and spot coated with one coat of vinyl wash pretreatment. Abraded or corroded areas on new surfaces not scheduled to be painted shall be cleaned by solvent wash, hand cleaned, and given 2 spot applications of zinc rich paint.

SHOP PRIMED SURFACES.--Dirt, oil, grease, or other surface contaminants shall be removed by water blasting, steam cleaning, or TSP wash. Minor surface imperfections shall be filled as required for new work. Mildew shall be removed by mildew wash. Chalking paint shall be removed by hand cleaning. The surfaces of existing hard or glossy coatings shall be abraded to dull the finish by hand cleaning or light abrasive blasting. Abrasive blasting shall not be used on wood or non-ferrous metal surfaces.

Chipped, peeling, blistered, or loose coatings shall be removed by hand cleaning, water blasting, or abrasive blasting. Bare areas shall be pretreated and primed as required for new work.

DEFINITIONS.--

DETERGENT WASH.--Removal of dirt and water soluble chemicals by scrubbing with a solution of detergent and water, and removal of all solution and residues with clean water.

HAND CLEANING.--Removal of dirt, loose rust, mill scale, excess base material, filler, aluminum oxide, chalking paint, peeling paint, or paint which is not firmly bonded to the surfaces by using hand or powered wire brushes, hand scraping tools, power grinders, or sandpaper and removal of all loose particles and dust prior to coating.

MILDEW WASH.--Removal of mildew by scrubbing with a solution of detergent, hypochlorite-type household bleach, and warm water, and removal of all solution and residues with clean water.

ABRASIVE BLASTING.--Removal of oil, grease, form release agents, paint, dirt, rust, mill scale, efflorescence, weak concrete, or laitance, by the use of airborne abrasives, and removal of loose particles, dust, and abrasives by blasting with clean air.

Abrasives shall be limited to clean dry sand, mineral grit, steel grit, or steel shot, and shall be graded to produce satisfactory results. Unwashed beach sand containing salt or silt shall not be used.

Abrasive blasting shall conform to the requirements of SSPC-SP6-85, Commercial Blast Cleaning, as defined in the Steel Structures Painting Council Manual.

Light abrasive blasting shall conform to the requirements of SSPC-SP7-85, Brush-Off Blast Cleaning, as defined in the Steel Structures Painting Council Manual.

SOLVENT WASH.--Removal of oil, grease, wax, dirt, or other foreign matter by using solvents, such as mineral spirits or xylol, or other approved cleaning compounds.

STEAM CLEANING.--Removal of oil, grease, dirt, rust, scale, or other foreign matter by using steam generated by commercial steam cleaning equipment, from a solution of water and steam cleaning compounds, and removal of all residues and cleaning compounds with clean water.

TSP WASH.--Removal of oil, grease, dirt, paint gloss, and other foreign matter by scrubbing with a solution of trisodium phosphate and warm water, and removal of all solution and residues with clean water.

WATER BLASTING.--High pressure, low volume water stream for removing dirt, light scale, chalking or peeling paint. Water blasting equipment shall produce not less than a 13 800 MPa minimum output pressure when used. Heated water shall not exceed 66°C. If a detergent solution is used, it shall be biodegradable and shall be removed from all surfaces with clean water.

PROTECTION.--The Contractor shall provide protective devices, such as tarps, screens or covers, as necessary to prevent damage to the work and to other property or persons from all cleaning and painting operations.

Paint or paint stains on surfaces not designated to be painted shall be removed by the Contractor at his expense and the original surface restored to the satisfaction of the Engineer.

APPLICATION.--

GENERAL.--Coatings shall be applied in accordance with the printed instructions and at the application rates recommended by the manufacturer to achieve the dry film thickness specified in these special provisions.

Mixing, thinning and tinting shall conform to the manufacturer's printed instructions. Thinning will be allowed only when recommended by the manufacturer.

Coatings shall be applied only when surfaces are dry and properly prepared.

Cleaning and painting shall be scheduled so that dust and other contaminants from the cleaning process will not fall on wet, newly coated surfaces.

Materials required to be coated shall have coatings applied to all exposed surfaces, including the tops and bottoms of wood and metal doors, the insides of cabinets, and other surfaces not normally visible from eye level.

APPLICATION SURFACE FINISH.--Each coat shall be applied to a uniform finish. Finished surfaces shall be free of surface deviations and imperfections such as skips, cloudiness, spotting, holidays, laps, brush marks, runs, sags, curtains, ropiness, improper cutting in, overspray, drips, ridges, waves, and variations in color and texture.

Each application of a multiple application finish system shall closely resemble the final color coat, except each application shall provide enough contrast in shade to distinguish the separate applications.

WORK REQUIRED BETWEEN APPLICATIONS.--Each application of material shall be cured in accordance with the coating manufacturer's recommendations before applying the succeeding coating. Enamels and clear finishes shall be lightly sanded, dusted, and wiped clean between applications.

Stain blocking primer shall be spot applied whenever stains bleed through the previous application of a coating.

TIMING OF APPLICATIONS.--The first application of the specified coating system shall be applied prior to any deterioration of the newly prepared surface. Metal surfaces shall be prepared and prime coated the same day that cleaning of bare metal is performed. Additional prime coats shall be applied as soon as drying time of the preceding coat permits.

Metal surfaces shall be prime coated within 12 hours of application of vinyl wash pretreatment.

Shellac sealer shall be allowed to dry at least 12 hours before applying the next coat.

Drying time between applications of water borne coatings shall be at least 12 hours.

APPLICATION METHODS.--Coatings shall be applied by brush, roller or spray. Rollers shall be of a type which do not leave a stippled texture in the paint film. Extension handles for rollers shall not be greater than 2 m in length.

If spray methods are used, surface deviations and imperfections such as, overspray, thickness deviations, lap marks, and orange peel shall be considered as evidence that the work is unsatisfactory and the Contractor shall apply the remainder of the coating by brush or roller, as approved by the Engineer.

DRY FILM THICKNESS.--

Bituminous paint 0.1 mm, minimum.

Epoxy polyamide primer 0.1 mm, minimum.

Aliphatic polyurethane enamel 0.05 mm, minimum.

Primers, undercoats, sealers, and coatings	As recommended by the manufacturer.
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CLEANING.--Upon completion of all operations, the coated surfaces shall be thoroughly cleaned of dust, dirt, grease, or other unsightly materials or substances.

Surfaces marred or damaged as a result of the Contractor's operations shall be repaired, at his expense, to match the condition of the surfaces prior to the beginning of the Contractor's operations.

COATING SYSTEMS.--The surfaces to be coated shall be as shown on the plans and as specified elsewhere in these special provisions. When a coating system is not shown or specified for a surface to be finish coated, the coating system to be used shall be as specified for the substrate material. The number of applications specified for each coating system listed herein is a minimum. Additional coats shall be applied if necessary to obtain a uniform color, texture, appearance, or required dry film thickness.

SYSTEM 1- GALVANIZED METAL.--

- 1 pretreat coat: vinyl wash pretreatment
- 1 prime coat: galvanized metal primer
- 2 finish coats: acrylic, exterior enamel, semi-gloss

SYSTEM 2- SHOP PRIMED STEEL.--

- 1 prime coat : red oxide ferrous metal primer
- 2 finish coats: alkyd, exterior enamel, semi-gloss

COLOR SCHEDULE.--Colors shall be as shown on the plans.

12-9.02 FIBERGLASS REINFORCED PLASTIC PANELS

GENERAL.--This work shall consist of furnishing and installing fiberglass reinforced plastic (FRP) panels and trim molding in accordance with details shown on the plans and these special provisions.

SUBMITTALS.--Manufacturer's descriptive data, installation instructions, and finish options shall be submitted for approval.

Product descriptive data shall show the manufacturer's name and shall indicate conformance to these special provisions.

Installation instructions shall show the FRP panel manufacturer's recommended method of installation.

Finish options shall show the manufacturer's standard color palette for FRP panels and trim molding. Color shall be selected from the manufacturer's standard color palette by the Engineer after the award of the contract.

PRODUCTS.--

FRP panel.--

FRP panel shall be Class I flame-spread, minimum nominal thickness of 2 mm; Marlite, Class A/I FRP; Kemlite, Fire-X Glasbord; or equal.

Trim molding.--

Trim molding shall be manufacturer's standard vinyl molding with nailing flanges and a 9 mm deep channel of sufficient width to receive panels and sealant.

Adhesive and sealant.--

Adhesive and sealant shall be as recommended by the FRP panel manufacturer.

EXECUTION.--

INSTALLATION.--The FRP panels and trim molding shall be installed in accordance with the manufacturer's installation instructions.

Trim molding shall be nailed through the flange into solid wood backing. All nails shall be concealed by FRP panels in the completed installation. Trim shall be one continuous piece along each wall unless the wall length exceeds the manufacturer's standard trim length. If more than one piece is used on one wall, the pieces shall be approximately equal length, with no piece less than 1 m in length. All FRP panel edges shall be covered by a trim molding.

Panels shall be one continuous piece along each wall unless the wall length exceeds the manufacturer's standard panel length. If more than one panel piece is used on one wall, the pieces shall be approximately equal length, with no piece less than one meter in length.

CLEAN-UP.--Adjacent surfaces shall be protected from adhesive or sealant. Excess adhesive and sealant shall be removed as the installation progresses using a solvent or cleaning agent recommended by the FRP panel manufacturer.

SECTIONS 12-10 THRU 12-14. (BLANK)

SECTION 12-15. MECHANICAL

12-15.01 MECHANICAL WORK

GENERAL.--

Scope.--This work shall consist of performing mechanical work in accordance with the details shown on the plans and these special provisions.

Mechanical work shall include furnishing all labor, materials, equipment and services required for providing ventilating and air conditioning systems.

Sheet metal, painting, electrical, and such other work incidental and necessary to the proper installation and operation of the mechanical work shall be in accordance with the requirements specified for similar type work elsewhere in these special provisions.

System layouts are generally diagrammatic and location of equipment is approximate. Exact routing of pipes, ducts, etc., and location of equipment is to be governed by structural conditions and obstructions. Equipment requiring maintenance and inspection is to be readily accessible.

Roof penetrations shall be flashed and sealed watertight in accordance with the requirements specified under "Sheet Metal Flashing" in Section 12-7, "Thermal and Moisture Protection," of these special provisions.

SUBMITTALS.--

Product data.--A list of materials and equipment to be installed, manufacturer's descriptive data, and such other data as may be requested by the Engineer shall be submitted for approval.

Manufacturer's descriptive data shall include complete description, performance data and installation instructions for the materials and equipment specified herein. Control and wiring diagrams, rough-in dimensions for plumbing fixtures, and component layout shall be included where applicable.

Manufacturer's descriptive data shall be submitted for the following:

Air Conditioner (total 2)

Fan

Centric Converter Assembly

Thermostats

CLOSEOUT SUBMITTALS.--

Operation and maintenance manuals.--Prior to the completion of the contract, 3 identified copies of the operation and maintenance instructions with parts lists for the equipment specified herein shall be delivered to the Engineer at the jobsite. The instructions and parts lists shall be indexed and bound in a manual form and shall be complete and adequate for the equipment installed. Inadequate or incomplete material shall be returned. The Contractor shall resubmit adequate and complete manuals at no expense to the State.

Operation and maintenance manuals shall be submitted for the following equipment:

Air Conditioner

QUALITY ASSURANCE.--

Codes and standards.--Mechanical work, including equipment, materials and installation, shall conform to the California Building Standards Code, Title 24, and to the California Code of Regulations, Title 8, Chapter 4, Division of Industrial Safety (DIS).

WARRANTY.--

Warranties and guarantees.--Manufacturer's warranties and guarantees for materials or equipment used in the work shall be delivered to the Engineer at the jobsite prior to acceptance of the contract.

12-15.02 VENTILATING AND AIR CONDITIONING EQUIPMENT AND SYSTEMS

PART 1.- GENERAL

Scope.--This work shall consist of furnishing, installing and testing ventilating and air conditioning (HVAC) equipment and systems in accordance with the details shown on the plans and these special provisions.

The performance rating and electric service of the HVAC equipment shall be as shown on the plans.

Temperature controls.--Thermostats, relays, timer switches, and other sensor type control devices required for this work shall be furnished and installed by the supplier of the heating, ventilating and air conditioning equipment. All temperature control wiring shall be furnished and installed in accordance with the requirements specified in Section 12-16, "Electrical," of these special provisions.

Codes and standards.--Equipment and systems shall conform to California State Energy Commission Regulations and, where applicable, shall be American Refrigeration Institute (ARI), American Gas Association (AGA), Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA), and Air Movement and Control Association (AMCA) approved for performance ratings and application shown on the plans.

Any appliance for which there is a California standard established in the Appliance Efficiency Standards may be installed only if the manufacturer has certified to the Commission, as specified in those regulations, that the appliance complies with the applicable standards for that appliance. Space conditioning equipment may be installed only if the manufacturer has certified that the equipment meets or exceeds all applicable efficiency requirements listed in the Energy Efficiency Standards.

PART 2.- PRODUCTS

COOLING UNITS.--

Air Conditioner(single package - rooftop).--

Air Conditioner shall be standard, commercial quality, single package, curb pump mounted unit with weatherproof acoustically lined cabinet. The cabinet shall have convenient access panels and a baked-on enamel finish. The roof curb shall be insulated and shall be supplied by the unit manufacturer.

Unit shall be specially designed for continuous compressor operation in the cooling mode and shall be protected by a suction-tube accumulator. The unit shall include a low ambient temperature kit.

Compressor shall be hermetically sealed unit, vibration isolated, with quick-start components, short cycling protection, pressure relief valve, high and low pressure switches, liquid-line filter-dryer and crankcase heater.

Indoor air blower shall be adjustable V-belt or direct drive type. The fan and fan motor shall provide the specified air flow, with wet coil, against the external static pressure as noted on the plans.

Motors shall have integral thermal overload protection.

FANS Exhaust fan (ceiling mounted).--

Roof fan.--

Roof fan shall be AMCA certified and shall be equipped with metal housing, centrifugal fan wheel, backdraft damper and bird screen. Fan motor and fan assembly shall be isolated from base with rubber vibration isolators. Fan motor shall have integral thermal overload protection. Roof fan shall be completely weatherproof and shall have a disconnect means under the hood. Roof curb shall be insulated and shall be supplied by the fan manufacturer. Roof fan shall be Penn; Jenn-Air; Cook; or equal.

HVAC CONTROLS.--

Thermostat.--

Thermostat shall be low voltage type, single set point range internally adjustable from 4°C to 27C, and provided with a blank cover.

AUXILIARY HVAC COMPONENTS.--

Unless specified herein, all components shall be sized and have the characteristics as shown on the plans.

Rigid ductwork.--

Rigid ductwork shall be galvanized steel sheet metal conforming to the latest edition of the SMACNA "Low Velocity Duct Construction Standards." Galvanized steel shall be cleaned by washing with mineral spirit solvent sufficient to remove any oil, grease or other materials foreign to the galvanized coating.

Duct supports.--

Duct supports shall be hot-dip galvanized steel.

Concentric converter assembly.--

Concentric converter assembly shall include side supply double deflection diffusers with adjustable aluminum louvers, center return with removable grille, molded fiberglass interior transition with supply air turning vanes, and duct connection collars.

Unit shall be factory assembled, internally sealed and supplied with hanging supports. Concentric converter assembly shall be Micro Metl; Stiles; or equal.

Flexible connection.--

Flexible connection shall be prefabricated type and shall be commercial quality flexible glass fabric coated on both sides with neoprene or hypalon.

Refrigerant and condensate drain piping.--

Refrigerant and condensate drain piping shall be rigid, Type L copper tubing with brazed solder fittings. The suction line shall be insulated, with vapor barrier and shall be weatherproofed for exterior installation. Factory sealed tubing shall not be used.

PART 3.- EXECUTION**INSTALLATION.--**

Condensate drains.--Air conditioning units shall be provided with condensate drain trap and piping. Outdoor piping shall extend to the nearest roof drain, gutter or as shown on the plans. Air gap shall be installed where required by code. Interior condensate drain piping shall be insulated with foam insulation.

Air outlets.--Volume dampers shall be furnished and installed for all diffusers. Blocking shall be provided on all sides of air outlets between ceiling or wall joists. Collars shall be supplied for all outlets and shall be taped and sealed in place.

Ducts and vents.--Ductwork within the building shall be installed to clear lighting fixtures, doors, windows and other obstructions. Ductwork shall preserve head room and shall keep openings and passageways clear whether shown on plans or not.

Ductwork shall be installed and braced according to the latest edition of the SMACNA "HVAC Duct Construction Standards."

Slopes in sides at transitions shall be approximately one to five. The ductwork system shall not contain abrupt changes or offsets of any kind unless otherwise shown on the plans.

Where ducts pass through walls, floors or ceilings, galvanized sheet metal or steel angle collars shall be installed around the ducts.

Duct sections shall be connected by beaded sleeve-type couplings using joint sealer as recommended by the duct manufacturer. Duct sections shall be mechanically fastened with pop rivets or sheet metal screws and sealed with mastic or insulated, reinforced silver tape.

Flexible connections shall be provided at both inlet and outlet of fan coil and ventilating units.

Sheet metal plenums shall be adequately braced and supported from the floor or structure with structural steel angles to prevent sagging, flexing and vibration.

All standing seams and transverse joints of supply, return and exhaust ducts and seams around plenums, fan and coil housings shall be sealed with sealant and taped.

Duct penetrations in fire rated assemblies.--Where ductwork passes through fire rated wall, floor or ceiling assemblies, the penetration shall be protected in accordance with the requirements specified under "Through-Penetration Firestopping" in Division 7, "Thermal and Moisture Protection," of these special provisions.

Duct penetrations in fire rated assemblies.--Where ductwork passes through fire rated wall, floor or ceiling assemblies, the penetration shall be protected in accordance with the requirements specified under "Through-Penetration Firestopping" in Section 12-7, "Thermal and Moisture Protection," of these special provisions.

FIELD QUALITY CONTROL.--

Pre-test requirements.--Before starting or operating systems, equipment shall be cleaned and checked for proper installation, lubrication and servicing.

In each system, at least one air path, from fan to final outlet, shall have all balance dampers open. The final air quantities shall be achieved by adjusting the volume dampers or the fan RPM.

Final adjustments and balancing of the systems shall be performed in such a manner that the systems will operate as specified and as shown on the plans.

The Contractor shall replace or revise any equipment, systems or work found deficient during tests.

All automatic operating devices which are pertinent to the adjustment of the aforementioned air systems shall be set and adjusted to deliver the required quantities of air and at temperatures specified by the Engineer. All control work shall be done in collaboration with the control manufacturer's representative.

Project completion tests.--The Engineer shall be notified at least 3 working days in advance of starting project completion tests.

Upon completion of mechanical work and pre-test requirements, or at such time prior to completion as determined by the Engineer, the Contractor shall operate and test installed mechanical systems for at least 3 consecutive 8-hour days to demonstrate satisfactory overall operation.

SECTION 12-16. ELECTRICAL

12-16.01 SUBSTATION ELECTRICAL WORK

SUMMARY

Scope.--This work shall consist of performing electrical work associated with the substation in accordance with the details shown on the plans and these special provisions.

Electrical work shall include furnishing all labor, materials, equipment and services required to construct and install the complete electrical system shown on the plans and the work of installing electrical connections for the thermostats, exhaust fan, air conditioners, and controls specified elsewhere in these special provisions.

System layouts are generally diagrammatic and location of equipment is approximate. Exact routing of conduits and other facilities and location of equipment is to be governed by structural conditions and other obstructions, and shall be coordinated with the work of other trades. Equipment requiring maintenance and inspection shall be located where it is readily accessible for the performance of such maintenance and inspection.

Related Work.--Earthwork, foundations, sheet metal, painting, mechanical and such other work incidental to and necessary for the proper installation and operation of the electrical work shall be done in accordance with the requirements specified for similar work elsewhere in these special provisions.

Order of Work.-- The electrical work for the substation shall be delayed until the bridge work in the area has been completed to the satisfaction of the Engineer.

QUALITY ASSURANCE

Codes and Standards.--All work performed and materials installed shall be in accordance with the National Electrical Code; the California Building Standards Code, Title 24, Part 3, "California Electrical Code," and the California Code of Regulations, Title 8, Chapter 4, "Electrical Safety Orders," and all local ordinances.

Warranties and Guarantees.--Manufacturer's warranties and guarantees for materials or equipment used in the work shall be delivered to the Engineer at the jobsite prior to acceptance of the contract.

TESTING

After the electrical system installation work has been completed, the electrical system shall be tested in the presence of the Engineer to demonstrate that the electrical system functions properly. The Contractor shall make necessary repairs, replacements, adjustments and retests at his expense. The Contractor shall provide 3 phase, 208 V, 60 Hz power to Panelboard SP1 for the duration of equipment testing. Three phase power supplied shall be of sufficient size to run all the substation electrical and mechanical equipment at the same time.

12-16.02 BASIC MATERIALS AND METHODS

SUMMARY

Scope.--This work shall consist of furnishing and installing conduits, conductors, fittings, and wiring devices in accordance with the details shown on the plans and these special provisions.

Conduits, conductors, fittings, and wiring devices shall include those accessories and appurtenances, not mentioned, that are required for the proper installation and operation of the electrical system.

Related Work.--Roof penetrations shall be flashed and sealed watertight conforming to the requirements specified under "Sheet Metal Flashing" in Section 12-7, "Thermal and Moisture Protection," of these special provisions.

SUBMITTALS

Product Data.--A list of materials and equipment to be installed, manufacturer's descriptive data, and such other data as may be requested by the Engineer shall be submitted for approval.

Manufacturer's descriptive data shall include complete description, performance data and installation instructions for the materials and equipment specified herein. Control and wiring diagrams, rough-in dimensions for recessed junction and pull boxes, and component layout shall be included where applicable. All control and power conductors on the shop drawings shall be identified with wire numbers.

Manufacturer's descriptive data shall be submitted for the following:

- Panelboard SP1
- DS-1 (total 2)
- Magnetic Contact switch
- Conductors
- Conduits
- Ground rods
- Exothermic welds
- Ground bus
- Intrusion Alarm Control Panel
- Ground well box

CONDUITS AND FITTINGS

Rigid Steel Conduit and Fittings.--Rigid steel conduit shall be threaded, full weight rigid steel, hot-dip galvanized inside and outside with steel or malleable iron fittings. Fittings shall be threaded unless otherwise specified or shown on the plans.

Rigid steel conduit shall be threaded, full weight rigid steel, hot-dip galvanized inside and outside with steel or malleable iron fittings. Fittings shall be threaded unless otherwise specified or shown on the plans.

Split or three-piece couplings shall be electroplated, malleable cast iron couplings.

Insulated grounding bushings shall be threaded malleable cast iron body with plastic insulated throat and steel, lay-in ground lug with compression screw.

Insulated metallic bushings shall be threaded malleable cast iron body with plastic insulated throat.

Electrical Metallic Tubing (EMT) and Fittings.--Electrical metallic tubing shall be formed of cold rolled strip steel, electrical resistance welded continuously along the longitudinal seam with zinc coating outside and enamel or lacquer coating inside.

Couplings shall be electroplated, rain and concrete tight, gland compression type, steel body couplings with malleable iron nuts.

Connectors shall be electroplated, rain and concrete tight, gland compression type, steel body connectors with male hub, malleable iron nut and insulated plastic throat.

Liquid Tight Flexible Metallic Conduit and Fittings.--Liquid tight flexible metallic conduit shall be fabricated in continuous length from galvanized sheet steel, spirally wound and formed to provide an interlocking design with an extruded polyvinyl chloride cover.

Fittings shall be electroplated, malleable cast iron body, with cap nut, grounding ferrule, and connector body with insulated throat.

Rigid Non-Metallic Conduit and Fittings.--Rigid non-metallic conduit shall be Schedule 40, high impact, nonconducting, self-extinguishing polyvinyl chloride (PVC) rigid non-metallic conduit for direct underground burial.

Couplings shall be PVC, socket type or thread on one end and socket type on the other end as required for the particular application.

Terminal adapters for adapting PVC conduit to boxes, threaded fittings, or metallic conduit system shall be PVC adapters with threads on one end and socket type on the other end.

CABLES AND CONDUCTORS

Cables.--Cables shall be stranded copper wire.

Conductors.-- Conductors shall be stranded copper wire.

Conductor insulation types unless otherwise shown or specified, shall be as follows:

1. Conductors across hinges of control panel enclosures shall be Type MTW.
2. Conductors shall be Type XHHW in wet and outdoor locations.
3. Conductors shall be Type THHN in dry locations.
4. Conductors for ground ring shall be bare stranded copper wire.

Wire Connections and Devices.--Wire connections and devices shall be pressure or compression type, except that connectors for No. 10 AWG and smaller conductors in dry locations may be preinsulated spring-pressure type.

ELECTRICAL BOXES

Outlet, Device and Junction Boxes.--Unless otherwise shown or specified, boxes shall be galvanized steel boxes with knock-outs and shall be the size and configuration best suited to the application indicated on the plans. Minimum size of outlet, receptacle, switch or junction boxes shall be 100 mm square by 40 mm deep, except that switch boxes for the installation of single switches and outlet boxes for flush-mounted light fixtures shall be 50 mm by 75 mm by 40 mm deep.

Multiple switches shall be installed in standard gang boxes, unless otherwise specified or shown on the plans.

Cast metal boxes shall be cast iron boxes with threaded hubs and shall be of the size and configuration best suited to the application shown on the plans.

Flush-mounted boxes shall have stainless steel covers, one mm thick. Cover screws shall be metal with finish to match cover finish.

Unless otherwise shown or specified, surface-mounted boxes shall have galvanized steel covers with metal screws.

Weatherproof junction boxes shall have cast metal covers with gaskets.

Weatherproof switch and receptacle boxes shall have gasketed covers with gasketed hinged flaps to cover switches and receptacles.

Underground Pull Boxes.--Pull boxes shall be high density reinforced concrete box with ultraviolet inhibitor polyethylene etched face anchored in concrete and fiberglass cover with hold down bolts. The polyethylene and fiberglass material shall be fire resistant and show no appreciable change in physical properties with exposure to the weather. No. 3 1/2 pull box shall be Brooks Products, No. 3 1/2; Christy Concrete Products, N9; or equal. No. 5 pull box shall be Brooks Products No. 5; Christy Concrete Products, N30; or equal.

Traffic rated pull boxes shall be high density reinforced concrete box with steel cover with hold down bolts and bonding strap. Pull box and cover shall be designed for H20 loading. No. 3 1/2 pull box shall be 250 mm by 430 mm and No. 5 pull box shall be 320 mm by 610 mm.

Ground Well Box.--Ground well box shall be high density reinforced concrete box with ultraviolet inhibitor polyethylene etched face anchored in concrete and fiberglass cover with hold down bolts. The polyethylene and fiberglass material shall be fire resistant and show no appreciable change in physical properties with exposure to the weather. Box size shall be as shown on the plans.

Traffic rated pull boxes shall be high density reinforced concrete box with steel cover with hold down bolts and bonding strap. Box and cover shall be designed for H20 loading.

RECEPTACLES AND SWITCHES

Duplex Receptacles.--Duplex receptacles shall be NEMA Type 5-20R, 3-wire, 20-ampere, 125-volt AC, safety grounding, ivory color, specification grade receptacle suitable for wiring with stranded conductors.

Timer Switch.--Timer switch shall be spring wound, single-pole, single throw switch, rated for one horsepower at 120 volts, AC. The timer switch shall fit in a single gang box. The timer switch shall be adjustable from 0 to 60 minutes.

MISCELLANEOUS MATERIALS

Pull Ropes.--Pull ropes shall be nylon or polypropylene with a minimum tensile strength of 225 kg.

Watertight Conduit Plugs.--Watertight conduit plugs shall be a hollow or solid stem expansion plugs complete with inner and outer white polypropylene compression plates and red thermoplastic rubber seal. Seal material shall be non-stick type rubber resistant to oils, salt, and alkaline substances normally available at the construction sites.

Anchorage Devices.--Anchorage devices shall be corrosion resistant, toggle bolts, wood screws, bolts, machine screws, studs, expansion shields, and expansion anchors and inserts.

Electrical Supporting Devices.--Electrical supporting devices shall be one hole conduit clamps with clamp backs, hot-dipped galvanized, malleable cast iron.

Construction channel shall be 41 mm x 41 mm, 2.66 mm (12-gage) galvanized steel channel with 13 mm diameter bolt holes, 40 mm on center in the base of the channel.

Ground Rod(s).--Ground rod(s) shall be a 19 mm (minimum) galvanized or copper clad steel rod, 3 meters long.

Ground Bus.--Ground bus shall be a solid copper bar of the size shown on the plans. It shall have holes drilled in it for terminating ground conductors. It shall come with mounting brackets, holes and insulators as required for installation.

Exothermic Weld.--Ground ring conductor connection to ground rods and ground conductor to ground ring conductor connection shall be fusion welded type made by molten copper flowing into weld cavity of a properly fitted graphite mold. Molten copper metal shall be a mixture of copper oxide and aluminum.

Each weld, bared copper conductor, and ground rod surrounding the weld for not less than 100 mm, shall be coated with an external protective coating.

A minimum of 2 coats of external protective coating shall be applied and the minimum dry film thickness shall be 0.2 mm per coat.

Exothermic Welding Equipment.--The welder size and shape and weld metal size and shape shall be as recommended by the manufacturer.

Exothermic welding equipment shall be ERICO Products, Inc., "Cadweld Process"; CONTENENTAL Industries, Inc., "Thermoweld Process"; or equal.

INSTALLATION

Conduit, General.--Rigid steel conduit shall be used unless otherwise shown on the plans or specified in these special provisions.

Electrical metallic tubing may be used in furred spaces and for exposed work indoors above the switch height.

Unless otherwise specified or shown on the plans, liquid-tight flexible metal conduit shall be used to connect motors, HVAC equipment, and other equipment subject to vibration.

Conduit Installation.--Conduit trade sizes are shown on the plans. No deviation from the conduit size shown on the plans will be permitted without written permission from the Engineer.

Conduit shall be concealed unless otherwise shown on the plans.

Conduits shall be tightly covered and well protected during construction using metallic bushings and bushing "pennies" to seal open ends.

A pull rope shall be installed in all empty conduits. At least one meter of pull rope shall be doubled back into the conduit at each termination.

Locations of conduit runs shall be planned in advance of the installation and coordinated with the ductwork, plumbing, ceiling and wall construction in the same areas and shall not unnecessarily cross other conduits or pipe, nor prevent removal of ceiling tiles or panels, nor block access to mechanical or electrical equipment.

Where practical, conduits shall be installed in groups in parallel, vertical or horizontal runs and at elevations that avoid unnecessary offsets.

Exposed conduit shall be installed parallel and at right angles to the building lines.

Conduits shall not be placed closer than 300 mm from a parallel hot water or steam pipe or 75 mm from such lines crossing perpendicular to the runs.

All raceway systems shall be secured to the building structures using specified fasteners, clamps and hangers.

Single conduit runs shall be supported by using one hole pipe clamps. Where run horizontally on walls in damp or wet locations, conduit shall be installed with "clamp backs" to space conduit off the surface.

Multiple conduit runs shall be supported with construction channel secured to the building structure. Conduits shall be fastened to construction channel with channel compatible pipe clamps.

Raceways of different types shall be joined using approved couplings or transition fittings.

Expansion couplings shall be installed where conduit crosses a building separation or expansion joint.

All floor and wall penetrations shall be sealed water-tight.

Existing underground conduit to be incorporated into a new system shall be cleaned with a mandrel or cylindrical wire brush and blown out with compressed air.

Conduit Terminations.--Rigid steel conduits shall be securely fastened to cabinets, boxes and gutters using 2 locknuts and specified insulating metallic bushing. Electrical metallic tubing shall be securely fastened to cabinets, boxes and gutters using specified connectors. Conduit terminations at exposed weatherproof enclosures and cast outlet boxes shall be made watertight using specified hubs.

Grounding bushings with bonding jumpers shall be installed on all type of conduits terminating at concentric knockouts and on all conduits containing service conductors, grounding electrode conductor, and conductors feeding separate buildings.

All future conduits terminated in underground pull boxes or exposed indoor and outdoor shall be provided with watertight conduit plugs.

Warning Tape.--Warning tape shall be placed over the ground ring cable and associated cabling. The warning tape shall be centered over the cable and 150 mm above it.

Conductor and Cable Installation.--Conductors shall not be installed in conduit until all work of any nature that may cause injury is completed. Care shall be taken in pulling conductors that insulation is not damaged. An approved non-petroleum base and insulating type pulling compound shall be used as needed.

All cables shall be installed and tested in accordance with manufacturer's recommendations.

Splices and joints shall be insulated with insulation equivalent to that of the conductor.

Provide 155 mm of slack at each outlet and device connection. If the outlet or device is not at the end of a run of wire, connection shall be made with correctly colored pigtails tapped to the runs with splices as specified herein.

Branch circuit conductors in panelboards and load centers shall be neatly trained along a path from the breaker terminals to their exit point. The conductors shall have ample length to transverse the path without strain, but shall not be so long as to require coiling, doubling back, or cramming. The path shall transverse the panelboard gutter spaces without entering a gutter containing service conductors and, unless otherwise shown on the plans, without entering the gutter space of any panelboard feeder.

All pressure type connectors and lugs shall be re-tightened after the initial set.

Splices in underground pull boxes and similar locations shall be made watertight.

Conductor Identification.--The neutral and equipment grounding conductors shall be identified as follows:

Neutral conductor shall have a white or natural gray insulation except that conductors No. 4 and larger may be identified by distinctive white marker such as paint or white tape at each termination.

Equipment grounding conductor shall be bare or insulated. If insulated, equipment grounding conductors shall have green or green with one or more yellow stripes insulation over its entire length except that conductors No. 4 and larger may be permanently identified by distinctive green markers such as paint or green tape over its entire exposed insulation.

Feeder and branch circuit ungrounded conductors shall be color coded by continuously colored insulation, except conductors No. 6 AWG or larger may be color coded by colored tape at each connection and where accessible. Ungrounded conductor color coding shall be as follows:

120/240V-Three phase	Black, orange, blue
120/208V-Three phase	Black, red, blue

Where more than one branch circuit enters or leaves a conduit, panel, gutter, or junction box, each conductor shall be identified by its panelboard and circuit number. All control conductors including control conductors of manufacturer supplied and field wired control devices shall be identified at each termination with the wire numbers shown on the plans, approved working drawings, and as directed by the Engineer where deemed necessary. Identification shall be made with one of the following:

1. Adhesive backed paper or cloth wrap-around markers with clear, heat shrinkable tubing sealed over either type of marker.
2. Self-laminating wrap around type, printable, transparent, permanent heat bonding type thermoplastic film markers.
3. Pre-printed, white, heat-shrinkable tubing.

Each terminal block shall have a molded marking strip attached with screws. The identifying numbers of the terminating conductors, as shown on the plans or on the submittal drawings, shall be engraved in the marking strip.

Outlet, Device and Junction Box Installation.--Where one or more threaded steel conduits are required to connect to an outlet, device, or junction box, the box shall be a cast metal box with threaded hubs. Unless otherwise shown on the plans or specified in these special provisions, all other boxes shall be sheet steel boxes. Weatherproof outlet, device and junction boxes shall have cast metal covers with gaskets. Unless otherwise shown on the plans or specified in these special provisions, all other boxes shall have standard galvanized covers.

All boxes shall finish flush with building walls, ceiling and floors except where exposed work is called for.

No unused openings shall be left in any box. Knockout seals shall be installed as required to close openings.

Outlet, device, and junction boxes shall be installed at the locations and elevations shown on the plans or specified herein. Adjustments to locations may be made as required by structural conditions and to suit coordination requirements of other trades.

Fixture outlet boxes installed in suspended ceilings of gypsum board or lath and plaster construction shall be mounted on 1.52 mm (16-gage) metal channel bars attached to main ceiling runners.

Fixture outlet boxes for pendant-mounted fixtures installed in suspended ceilings supporting acoustical tiles or panels shall be supported directly from the structures above.

Underground Pull Box Installation.--Electrical pull box covers or lids shall be marked "ELECTRICAL." Telephone service pull box covers or lids shall have plain, unmarked covers.

The bottom of pull boxes shall be bedded in 155 mm of clean, crushed rock or gravel and shall be grouted with 40 mm thick grout prior to installation of conductors. Grout shall be sloped to a 25 mm PVC pipe drain hole. Conduit shall be sealed in place with grout.

Top of pull boxes shall be flush with surrounding grade or top of curb. In unpaved areas where pull box is not immediately adjacent to and protected by a concrete foundation, pole or other protective construction, the top of pull box shall be set at plus 30 mm above surrounding grade. Pull boxes shown on the plans in the vicinity of curbs shall be placed adjacent to the back of curb. Pull boxes shown on the plans adjacent to lighting standards shall be placed on the side of foundation facing away from traffic.

Ground Well Box Installation.—Ground well box covers shall have plain, unmarked covers. The bottom of the box shall be bedded in 155 mm of clean crushed rock or gravel. Installation shall be as shown on the plans.

Ground Rod(s) Installation.--The ground rod(s) for the ground ring shall be driven vertically until the top is 150 mm below finished grade. When vertical penetration of the ground rod cannot be obtained, an equivalent horizontal grounding system, approved by the Engineer, shall be installed. The ground rods shall be bonded to the ground ring conductor by means of exothermic welds.

Anchorage.--Hangers, brackets, conduit straps, supports, and electrical equipment shall be rigidly and securely fastened to surfaces by means of toggle bolts on hollow masonry; expansion shields and machine screws, or expansion anchors and studs or standard preset inserts on concrete or solid masonry; machine screws or bolts on metal surfaces; and wood or lag screws on wood construction.

Anchorage devices shall be installed in accordance with the anchorage manufacturer's recommendations.

Mounting Heights.--Electrical system components shall be mounted at the following mounting heights, unless otherwise shown on the plans. The mounting height dimensions shall be measured above the finished floor to the bottom of the device or component.

Thermostats	1.25 m
Wall switches	1.0 m
Convenience outlets	1.25 m
Telephone and radio outlets	510 mm minimum

TESTING

Exothermic Welding Test.-- Welds shall be tested by striking around the weld with an one kg hammer while the conductor is being pulled. For this test, the conductor shall be pulled parallel to the weld surface, and the weld shall be struck with the hammer at an angle of 45 degrees to the surface. Defective welds shall be removed and replaced at the Contractor's expense.

12-16.03 ELECTRICAL EQUIPMENT

SUMMARY

Scope.--This work shall consist of furnishing and installing panelboards,disconnect switches, and related accessories in accordance with the details shown on the plans and these special provisions.

Related Work.--Anchorage devices shall be as specified under "Basic Materials and Methods" elsewhere in this Section 12-16.

SUBMITTALS

Product Data.--A list of materials and equipment to be installed, manufacturer's descriptive data, and such other data as may be requested by the Engineer shall be submitted for approval.

Manufacturer's descriptive data shall include complete description, performance data and installation instructions for the materials and equipment specified herein. Control and wiring diagrams, rough-in dimensions, and component layout shall be included where applicable. All control and power conductors on the shop drawings shall be identified with wire numbers.

PANELBOARDS

Panelboard SP1.--Panelboard SP1 shall be indoor type, surface-mounted, factory assembled, 3-phase, 4-wire, 120/208-volt, AC panelboard 500 mm wide with 200-ampere main circuit breaker, 42 circuits, groundable neutral, hinged door and molded case branch circuit breakers as shown on the plans. Panel shall be Square D Company, Type NQOD; Westinghouse, Type AQ; General Electric, Type Power-R-Line 1; or equal.

SWITCHES

Air Conditioner Disconnect Switch, DS-1 (total 2).-- Air conditioner disconnect switch shall be 3-pole, 240-volt, AC, 60-ampere, fused, heavy duty safety switch in a NEMA-3R enclosure. The fuses shall be sized to suit the air conditioning unit furnished.

Nameplates.--Nameplates shall be laminated phenolic plastic with white core and black front and back. Nameplate inscription shall be in capitals letters etched through the outer layer of the nameplate material.

INSTALLATION

Panelboard Installation.--Set cabinets plumb and symmetrical with building lines. Train interior wiring as specified under "Conductor and Cable Installation" in "Basic Materials and Methods" of these special provisions. Touch-up paint any marks, blemishes, or other finish damage suffered during installation. Replace cabinets, doors or trim exhibiting dents, bends, warps or poor fit which may impede ready access, security or integrity.

Mounting height shall be 1.4 meters to the highest circuit breaker handle, measured above the finished floor.

Where "Future" or "Space" is indicated on the plans, branch connectors, mounting brackets, and other hardware shall be furnished and installed for future breaker.

A typewritten directory under transparent protective cover shall be provided and set in metal frame inside each cabinet door. Directory panel designation for each circuit breaker shall include complete information concerning equipment controlled, including room number or area designated on the plans.

Equipment Identification.--Equipment shall be identified with nameplates fastened with self-tapping, cadmium-plated screws or nickel-plated bolts.

Nameplate inscriptions shall read as follows:

Item	Letter height, mm	Inscription
Panelboard SP1	6	Panelboard SP1, 120/208V, 3Phase, 4 Wire
DS-1 (total 2)	6	AC Disconnect

12-16.04 LIGHTING

GENERAL.--This work shall consist of furnishing, installing and connecting all lighting equipment in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--Manufacturer's descriptive information, photometric curves, catalog cuts, and installation instructions shall be submitted for approval.

PRODUCTS

Lighting Fixture Lamps.-- Lighting fixture lamps shall be type and size as shown on the plans. Lamps shall be General Electric, Phillips, Sylvania, or equal. Fluorescent lamps, unless otherwise noted, shall be 4100K tri-phosphor with a CRI of 70 or greater.

Ballasts.-- All fluorescent fixtures shall be equipped with high power factor ballasts suitable for the line voltage and for the type, size and number of lamps required by the fixture. Fluorescent ballasts shall be UL Listed, Class P and ETL Certified ballasts. All ballasts except 800-milliamper ballasts shall have sound rating A. Fluorescent ballasts except for 800-milliamper ballasts shall be high-frequency electronic ballasts with power factor greater than 0.95, ballast factor at least 0.87, total harmonic distortion less than 10 percent, crest factor less than or equal to 1.6, complying with ANSI C 62.41 Category A for surge protection, and FCC Part 18 for interference. Dimming ballasts shall be high frequency ballasts as specified above and shall be capable of dimming the light output from 100 percent to 20 percent of the rated light output.

Lighting Fixtures.-- Lighting fixtures shall be as shown on the plans and as specified herein. Outdoor luminaires shall be listed and labeled "Fixture Suitable For Wet Locations."

F1.--Ceiling-mounted fluorescent fixture with two F40 lamps, electronic ballast and one-piece, clear acrylic, wrap-around diffuser. The fixture shall be Day Brite, Catalog No. AWN 240; Keystone Lighting, Catalog No. PRN 240-A; Lithonia, Catalog No. LB 240; or equal.

H1.-- Outdoor, wall mounted, 70-watt, 120-volt high pressure sodium luminaire with integral ballast and photocontrol. The luminaire shall be Holophane, Catalog No. WL2K-070HP- 12-BK-F1 with WL2KKPR12; ITT, Catalog No. 181-562E1; Day-Brite , Catalog No. WLM 70HS 12 PE ; Lithonia, Catalog No. TWH 70S 120 PE; or equal.

EXECUTION

LIGHTING FIXTURES.--Lighting fixtures shall be mounted securely in accordance with the manufacturer's recommendations. Mounting methods shall be suitable for the particular type of ceiling or support at each location.

The Contractor shall provide all supports, hangers, spacers, channels, fasteners and other hardware necessary to support the fixtures.

Fixtures shall be set at the mounting heights shown on the plans, except heights shown shall be adjusted to meet conditions.

BALLASTS.--All fluorescent fixtures shall be equipped with high power factor ballasts suitable for the line voltage and for the type, size and number of lamps required by fixture.

All ballasts used in unheated areas inside the building shall be rated to fully operate at -20°C or less.

12-16.05 INTRUSION ALARM SYSTEM

SUMMARY

Scope.--This work shall consist of furnishing and installing a complete and operational intrusion alarm system in accordance with the details shown on the plans and these special provisions.

The system shall include all materials, whether mentioned or not, that are necessary for a complete and operational intrusion alarm system.

SYSTEM DESCRIPTION

Design Requirements.--The intrusion alarm system shall be a low voltage, direct current, zoned alarm system, and shall consist of a security control panel, magnetic contact switches. Each zone shall be "supervised, Class B circuit." The end of line resistor shall be installed in the control panel.

The alarm system shall self-test and report status of individual zones.

The alarm system shall provide an automatically rechargeable back-up power supply system in case of building power interruption.

The alarm system components shall be U.L. or F.M. Listed. The system proposed shall be approved by the Federal Communication Commission (FCC).

SUBMITTALS

Product data.--Manufacturer's descriptive information and installation instructions shall be submitted for approval.

Installation instructions shall include manufacturer and catalog reference, and model number of equipment to be furnished, conduit and conductor sizes, wiring diagram, and floor plan showing locations of multiple switch contact monitor and devices.

QUALITY ASSURANCE

Installer qualification.--The installer of the security alarm system shall be licensed by the State Department of Consumer Affairs, Bureau of Collection and Investigative Services. License numbers and expiration dates shall be included on all correspondence.

PRODUCTS

Security Control Panel.--The security control panel shall be a surface-mounted, locking cabinet, completely self-contained control panel suitable for 120-volt, AC, input power with separate terminals for all external wires.

The security control panel shall meet the following requirements:

- Compatible with Radionics 6000 or 6500 receiver or equivalent;
- Minimum 4 zones;
- Digital dialer communicator;
- 12-volt auxiliary power supply;
- Rechargeable battery (8 hour minimum);
- Battery charger;
- Low battery reporting;
- Silent alarm signaling;
- System connected to RJ31X or RJ38X telephone jack or equivalent;
- Line test every twenty-four (24) hours;
- 120-volt, AC, input;
- Front accessible control and indication digital keypad;
- UL Listed for commercial use;
- Remote control identification.

Magnetic Contact Switch.-- Magnetic door switch for pedestrian door shall be a 2-section, self-lock mounting type switch, and shall be compatible with the material of the door on which it is installed. The switch shall be epoxied in the switch housing. Magnetic contact switches shall be the type capable of being concealed on the top of the door frame.

Magnetic contact switches for the overhead vehicle doors shall be 2-section, extra heavy-duty, floor mounting type switch with stainless steel armored cable.

Switch shall be housed in a non-magnetic case.

INSTALLATION

General.--The intrusion alarm system shall be installed in accordance with the manufacturer's recommendations.

The switch section without wires shall be recessed flush into the top edge of the door at the approximate center of the door, and the switch section with wires shall be recessed flush in the top section of the door frame. The two sections of the switch shall be mounted directly opposite each other to provide maximum sensitivity. The wiring from each magnetic switch shall be run to the control panel in the zone dedicated for the intrusion alarm circuit.

The switch section mounted on the bottom edge of the overhead door shall be without wires. The switch section with wire shall be mounted on the floor directly below the switch part without wires. Magnetic contact switches for overhead doors shall be mounted .

Intrusion Alarm Zoning.--Intrusion alarm panel zoning at Substation Near Pier 3 shall be as follows:

Zone 1: Pedestrian double doors (West wall) Item No. 1.

Zone 2: Pedestrian doors (North, South, and East)_Items No. 2, 3, and 4 respectively.

Conduit and Conductors.--All intrusion alarm system wiring shall be installed in conduit system conforming to the requirements under "Basic Materials and Methods" elsewhere in these special provisions. Conduit size shall be as recommended by the intrusion alarm manufacturer, except that conduits shall be not less than 16 mm diameter.

All conductors and cables for the intrusion alarm system wiring shall be as recommended by the intrusion alarm system manufacturer.

FIELD QUALITY CONTROL

Testing.--The operational test for the intrusion alarm system shall be performed by the Contractor in the presence of the Engineer. The operational tests shall demonstrate that all functions of the system operate in the manner described in the manufacturer's literature and demonstrate system stability under normal vibration and shocks to components. The Contractor shall notify the Engineer in writing not less than 10 days in advance of performing the operational tests.

DEMONSTRATION

Training.--The Contractor shall provide one hour of on-site training on the use, operation, and maintenance of the system for not more than 8 designated State employees. The Contractor shall notify the Engineer in writing not less than 10 days in advance of proposed training class.

SECTION 13. RAILROAD RELATIONS AND INSURANCE REQUIREMENTS

SECTION 13-1. RELATIONS WITH RAILROAD COMPANY

13-1.01 GENERAL.-- The term "Railroad" shall be understood to mean the Union Pacific Railroad Company.

It is expected that the Railroad will cooperate with the Contractor to the end that the work may be handled in an efficient manner. However, except for the additional compensation provided for hereinafter for delays in completion of specific unit of work to be performed by the Railroad, and except as provided in Public Contracts Code Section 7102, the Contractor shall have no claim for damages, extension of time, or extra compensation in the event his work is held up by any of the work to be performed by the Railroad.

The Contractor must understand the Contractor's right to enter Railroads property is subject to the absolute right of Railroad to cause the Contractor's work on Railroad's property to cease if, in the opinion of Railroad, Contractor's activities create a hazard to Railroad's property, employees, and/or operations.

RAILROAD REQUIREMENTS.-- The contractor shall notify Mr. Jim Smith, Railroad's Public Project Manager, 10031 Foothill Boulevard, Roseville, CA 95678, telephone (916) 789-6352 (FAX 916 789-6333) and the Engineer, in writing, at least ten (10) working days before performing any work on, or adjacent to the property or tracks of the Railroad.

The Contractor shall cooperate with the Railroad where work is over or under the tracks, or within the limits of Railroad property, in order to expedite the work and to avoid interference with the operation of railroad equipment.

The Contractor shall comply with the rules and regulations of Railroad or the instructions of its representatives in relation to the proper manner of protecting the tracks and property of Railroad and the traffic moving on such tracks, as well as the wires, signals and other property of Railroad, its tenants or licensees, at and in the vicinity of the work during the period of construction.

The Contractor shall perform his work in such manner and at such times as shall not endanger or interfere with the safe operation of the tracks and property of Railroad and traffic moving on such tracks, as well as wires, signals and other property of Railroad, its tenants or licensees, at or in the vicinity of the work.

The Contractor shall take protective measures necessary to keep railroad facilities, including track ballast, free of sand or debris resulting from his operations. Any damage to railroad facilities resulting from Contractor's operations will be repaired or replaced by Railroad and the cost of such repairs or replacement shall be deducted from the contractor's progress and final pay estimates.

The Contractor shall contact the Railroad's "Call Before You Dig" at least 48 hours prior to commencing work, at 1-800-336-9193 (a 24 hour number) to determine location of fiber optics. If a telecommunications system is buried anywhere on or near railroad property, the Contractor will co-ordinate with the Railroad and the Telecommunication Company(ies) to arrange for relocation or other protection of the system prior to beginning any work on or near Railroad Property.

The Contractor will perform the necessary grading and surfacing work for the remaining portion of the Mococo Road Crossing and shall install any necessary drainage facilities.

The Contractor shall not pile or store any materials nor park any equipment closer than 25'- 0" to the centerline of the nearest track, unless directed by Railroad's representative.

The Contractor shall also abide by the following temporary clearances during the course of construction:

12'-0" horizontally from centerline of track
21'-0" vertically above top of rail

The temporary vertical construction clearance above provided will not be permitted until authorized by the Public Utilities Commission. It is anticipated that authorization will be received not later than fifteen days after the approval of the contract by the Attorney General. In the event authorization is not received by the time specified, and, if in the opinion of the Engineer, the Contractor's operations are delayed or interfered with by reason of authorization not being received by the said

time, the State will compensate the Contractor for such delay to the extent provided in Section 8-1.09, "Right of Way Delays," of the Standard Specifications and not otherwise.

Walkways with railing shall be constructed by Contractor over open excavation areas when in close proximity of tracks, and railings shall not be closer than 8'-6" horizontally from centerline of the nearest track, if tangent, or 9'-6" if curved.

Any infringement on the above temporary construction clearances due to the Contractor's operations shall be submitted to the Railroad by way of Engineer, and shall not be undertaken until approved by the Railroad, and until the Engineer has obtained any necessary authorization from any governmental body or bodies having jurisdiction thereover. No extension of time or extra compensation will be allowed in the event the Contractor's work is delayed pending Railroad approval and governmental authorization.

When the temporary vertical clearance is less than 22'-6" above top of rail, Railroad shall have the option of installing tell-tales or other protective devices Railroad deems necessary for protection of Railroad trainmen or rail traffic.

Four sets of plans and calculations approved by the Engineer, showing details of construction affecting the Railroad's tracks and property not included in the contract plans, including but not limited to shoring and falsework, shall be submitted to the Railroad for approval. Shoring and falsework design shall be in accordance with Southern Pacific Lines (SPL) Guidelines for shoring and falsework, latest edition, issued by the Railroad's Office of Chief Engineer. Shoring and falsework plans and calculations shall be prepared and signed by a registered professional engineer. This work shall not be undertaken until such time as the Railroad has given such approval, review by Railroad may take up to six (6) weeks after receipt of all necessary information. In no case shall the Contractor be relieved of responsibility for results obtained by the use of said plans.

The Contractor shall notify the Engineer in writing, at least 25 calendar days but not more than 40 days in advance of the starting date of installing temporary work with less than permanent clearance at each structure site. The Contractor will not be permitted to proceed with work across railroad tracks unless this requirement has been met. No extension of time or extra compensation will be allowed in the event that the Contractor's work is delayed because of his failure to comply with the requirements in this paragraph.

Private crossings at grade over tracks of Railroad for the purpose of hauling earth, rock, paving or other materials will not be permitted. If the Contractor, for the purpose of constructing highway-railway grade separation structures, including construction ramps thereto, desires to move equipment or materials across Railroad's tracks, Contractor must first obtain permission from Railroad. Should Railroad approved the crossing, Contractor may be required to execute a private crossing agreement. By this agreement, the Contractor would be required to bear the cost of the crossing surface, together with any warning devices that might be required. Contractor shall furnish his own employees as flagmen to control movements of vehicles on the private roadway and shall take all measures necessary to prevent the use of such roadway by unauthorized persons and vehicles.

No blasting will be permitted by Contractor unless approved by the Railroad.

The Contractor shall, upon completion of the work covered by this contract to be performed by Contractor upon the premises or over or beneath the tracks of Railroad, promptly remove from the premises of Railroad all of Contractor's tools, implements and other materials, whether brought upon said premises by said Contractor or any subcontractor, employee or agent of Contractor or of any subcontractor, and cause said premises to be left in a clean and presentable condition.

All under track pipeline installations shall be constructed in accordance with Railroad's current standards which may be obtained from Railroad. The general guidelines are as follows:

Edges of jacking or boring pit excavations shall be kept a minimum of 20 feet from the centerline of the nearest track. If the pipe to be installed under the track is four (4) inches in diameter or less, the top of the pipe shall be at least 42 inches below base of rail. If the pipe diameter is greater than four (4) inches in diameter, it must be encased and the top of the steel pipe casing shall be at least 66 inches below base of rail. Installation of any pipe or conduit under Railroad's tracks is to be done by dry bore and jack method. No hydraulic jacking or boring will be permitted. Care is to be exercised so as not to damage any underground facilities of Railroad.

13-1.03 Access.- - The Contractor will be provided access from Bayshore Road on the north side and Mococo Road from the south side. If the Contractor or any subcontractor fails to obey the Stop Sign at the Railroad's tracks leaving the construction area to Bayshore Road, the Railroad will require the Contractor to pay for a flagger for the remainder of the

project at a cost of \$500 per day. The K-rail, with fence, on Bridgehead Drive adjacent to the tracks is to remain in place unless the Contractor notifies the Engineer and the Railroad so a flagger can be provided until the K-rail is reinstalled.

13-1.04 PROTECTION OF RAILROAD FACILITIES

(1). Upon advance notification of not less than 72 hours by Contractor, Railroad representatives, conductors, flagmen or watchmen will be provided by Railroad to protect its facilities, property and movements of its trains or engines. In general, Railroad will furnish such personnel or other protective devices:

- (a) When any part of any equipment is standing or being operated within 25 feet, measured horizontally, from centerline of any track on which trains may operate, or when any erection or construction activities are in progress within such limits, regardless of elevation above or below track.
- (b) For any excavation below elevation of track subgrade if, in the opinion of Railroad's representative, track or other Railroad facilities may be subject to settlement or movement.
- (c) During any clearing, grubbing, grading or blasting in proximity to Railroad which, in the opinion of Railroad's representative, may endanger Railroad facilities or operations.
- (d) During any of Contractor's operations when, in the opinion of Railroad's representatives, Railroad facilities, including, but not limited to, tracks, buildings, signals, wire lines or pipe lines, may be endangered.

(2) The cost of flagging and inspection provided by Railroad during the period of constructing that portion of the project located on or near Railroad property, as deemed necessary for the protection of Railroad's facilities and trains, will be borne by the State for a period of a 150 working days beginning on the date work commences on or near property of Railroad. The Contractor shall pay to the State liquidated damages in the sum of \$500 per day for each day in excess of the above 150 working days the Contractor works on or near Railroad property, and which requires flagging protection of Railroad's facilities and trains.

13-1.05 WORK BY RAILROAD.- Railroad will furnish or cause to be furnished as necessary due to construction, labor materials, tools and equipment to perform certain works including relocation of telephone, telegraphy and signal lines and appurtenances and will perform any other work in connection therewith.

The work by Railroad will be performed by its own forces and is not a part of the work under this contract.

- (a) The Railroad will perform preliminary engineering inspection and flagging as specified in Section 13-1.03 "Protection of Railroad Facilities".
- (b) Railroad will realign tracks, relocate switches and other facilities necessary to allow the construction of the new Mococo Road Crossing including installation of concrete panels and crossing protection.

13-1.06 DELAYS DUE TO WORK BY RAILROAD.--A delay due to work by Railroad will be considered to occur whenever:

- (a) the Contractor has provided the minimum required notice, as provided herein, as to the date his work will permit the Railroad to begin work on a specific unit of work listed in the following table, and
- (b) the Railroad has not completed said specific unit of work within the number of performance days listed for that unit after said date or the date when the site was made available to the Railroad, whichever is later, and
- (c) in the opinion of the Engineer the Contractor's operations are delayed or interfered with by reason of the Railroad not completing the unit of work on time, and
- (d) the Contractor has provided written notice to the Engineer that his operations are being delayed or interfered with by reason of the Railroad not completing the unit of work on time.

Unit of Work	Minimum Required Notice, Calendar Days	Performance Days
Realign tracks, relocate switches and other facilities	60	60
Install crossing protection and Concrete panels	90	90

The Contractor shall notify the Engineer of the dates when the Contractor will have completed all work necessary to permit the Railroad to begin work on each of the above units of work. Such notice shall be provided, in writing, at least the number of days listed above under "Minimum required notice," in advance of said dates. If after providing said notice, it becomes apparent to the Contractor that his work will not progress to the stage necessary to permit the Railroad to begin work on the scheduled date, the Contractor shall file a corrected notice with the Engineer. Should a corrected notice not be filed in sufficient time to prevent the Railroad from unnecessarily mobilizing men and equipment, including movement to the job site, any related costs incurred by the Railroad for nonproductive work shall be borne by the Contractor and sums sufficient to cover the claims based upon bills rendered to the State by Railroad for such costs will be deducted from the progress and final pay estimates due to the Contractor.

A performance day is defined as any day on which the Railroad crew which is performing the unit of work would normally work except days on which the crew is prevented by inclement weather or conditions resulting immediately therefrom, as determined by the Engineer, from proceeding with at least 75 percent of the normal labor and equipment force for at least 60 percent of the total daily time currently spent on the unit of work.

If delays due to work by the Railroad occur, and the Contractor sustains loss which, in the opinion of the Engineer, could not have been avoided by the judicious handling of forces, equipment and plant, the amount of said loss shall be determined as provided in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

If a delay due to work by Railroad occurs, an extension of time determined pursuant to the provisions in Section 8-1.07, "Liquidated Damages," of the Standard Specifications will be granted.

13-1.07 LEGAL RELATIONS.- The provisions of this section, "Relations with Railroad Company" and the provisions of the following section, "Railroad Protective Insurance," of these special provisions shall inure directly to the benefit of Railroad. .

SECTION 13-2. RAILROAD PROTECTIVE INSURANCE

The term "Railroad" shall be understood to mean the Union Pacific Railroad Company.

In addition to any other form of insurance or bonds required under the terms of the contract and specifications, the Contractor will be required to carry insurance of the kinds and in the amounts hereinafter specified.

Such insurance shall be approved by the Railroad before any work is performed on Railroad's property and shall be carried until all work required to be performed on or adjacent to the Railroad's property under the terms of the contract is satisfactorily completed as determined by the Engineer, and thereafter until all tools, equipment and materials have been removed from Railroad's property and such property is left in a clean and presentable condition.

The insurance herein required shall be obtained by the successful bidder and he shall furnish the Railroad Agreements Branch, MS # 9, Engineering Service Center, Department of Transportation, State of California, 1801 30th Street, Sacramento, California 95816, with two completed certificates, in the form attached hereto, signed by the insurance company or its authorized agent or representative, reflecting the existence of each of the policies required by 1 and 2 below including coverage for X, C and U and completed operations hazards, the original policy of insurance and one certified copy thereof required by 3 below. Railroad Agreements Branch Engineer will convey one of the certificates of policy certifying 1 and 2 and the original policy of insurance required by 3 to Railroad upon receipt from successful bidder. Engineer will notify successful bidder whether Railroad approves the insurance policies.

Certificate of insurance shall guarantee that the policy under 1 and 2 will not be amended, altered, modified or canceled insofar as the coverage contemplated hereunder is concerned, without at least thirty (30) days notice mailed by registered mail to the Railroad Agreements Branch Engineer and to Railroad.

Full compensation for all premiums which the Contractor is required to pay on all the insurance described hereinafter shall be considered as included in the prices paid for the various items of work to be performed under the contract, and no additional allowance will be made therefor or for additional premiums which may be required by extensions of the policies of insurance.

The approximate ratio of the estimated cost of the work over or under or within 50 feet of Railroad's tracks to the total estimated cost is 0.50 . Approximate daily train traffic is 8 passenger trains and 5 freight trains.

**1. Contractor's Public Liability and Property
Damage Liability Insurance**

The Contractor shall, with respect to the operations he performs within or adjacent to Railroad's property, carry regular Contractor's Public Liability and Property Damage Liability Insurance providing for the same limits as specified for Railroad's Protective Public Liability and Property Damage Liability insurance to be furnished for and in behalf of Railroad as hereinafter provided.

If any part of the work within or adjacent to Railroad's property is subcontracted, the Contractor in addition to carrying the above insurance shall provide the above insurance on behalf of the subcontractors to cover their operations.

**2. Contractor's Protective Public Liability and Property
Damage Liability Insurance.**

The Contractor shall, with respect to the operations performed for him by subcontractors who do work within or adjacent to Railroad's property, carry in his own behalf regular Contractor's Protective Public Liability and Property Damage Liability Insurance providing for the same limits as specified for Railroad's Protective Public Liability and Property Damage Liability Insurance to be furnished for and on behalf of Railroad as hereinafter provided.

**3. Railroad's Protective Public Liability and Property
Damage Liability Insurance**

The Contractor shall, with respect to the operations he performs within or adjacent to Railroad's property or that of any of his subcontractors who do work within or adjacent to Railroad's property perform, have issued and furnished in favor of Railroad, Policy or policies of insurance in the Railroad Protective Liability Form as hereinafter specified.

Railroad Protective Liability Form

(Name of Insurance Company)

DECLARATIONS

Item 1. Named Insured:

Union Pacific Railroad Company
1416 Dodge Street - Mail Code 10049
Omaha, Nebraska 68179

Item 2. Policy Period: From _____ to _____ 12:01 a.m., Standard Time, at the designated job site as stated herein.

Item 3. The insurance afforded is only with respect to such of the following coverage's as are indicated in Item 6 by specific premium charge or charges. The limit of the company's liability against such coverage or coverage's shall be as stated herein, subject to all the terms of this policy having reference thereto.

Coverage's		Limits of Liability	
		Each Occurrence	Aggregate
A B & C	Bodily Injury Liability Property Damage Liability and Physical Damage to Property	\$2,000,000 Combined Single Limit	\$6,000,000 for Coverage's A, B & C

Item 4. Name and Address of Contractor:

Item 5. Name and Address of Governmental Authority for whom the work by the Contractor is being performed:
State of California, acting by and through its Department of Transportation, P.O. Box 942874, Sacramento,
California 94274-0001

Item 6. Designation of the Job Site and Description of Work:

FOR CONSTRUCTION ON _____

Premium Bases	Rates per \$100 of Cost		Advance Premiums	
	Coverage A	Coverage's B & C	Coverage A	Coverage's B & C
Contract Cost	\$	\$	\$	\$
Rental Cost	\$	\$	\$	\$

Countersigned _____ 19__ by _____

Title

POLICY

(Name of Insurance Company)

A _____ insurance company, herein called the company, agrees with the insured, named in the declarations made a part hereof, in consideration of the payment of the premium and in reliance upon the statements in the declaration made by the named insured and subject to all of the terms of this policy:

INSURING AGREEMENTS

I. Coverage A--Bodily Injury Liability.

To pay on behalf of the insured all sums which the insured shall become legally obligated to pay as damages because of bodily injury, sickness, or disease, including death at any time resulting therefrom, hereinafter called "bodily injury," either (1) sustained by any person arising out of acts or omissions at the designated job site which are related to or are in connection with the work described in Item 6 of the declarations, or (2) sustained at the designated job site by the Contractor or any employee of the Contractor, or by any employee of the Governmental Authority specified in Item 5 of the Declarations, or by any designated employee of the insured whether or not arising out of such acts or omissions.

Coverage B--Property Damage Liability.

To pay on behalf of the insured all sums which the insured shall become legally obligated to pay as damages because of physical injury to or destruction of property, including loss of use of any property due to such injury or destruction, hereinafter called "property damage," arising out of acts or omissions at the designated job site which are related to or are in connection with the work described in Item 6 of the declarations.

Coverage C--Physical Damage to Property.

To pay for direct and accidental loss of or damage to rolling stock and their contents, mechanical construction equipment, or motive power equipment, hereinafter called "loss," arising out of acts or omissions at the designated job site which are related to or are in connection with the work described in Item 6 of the declarations; provided such property is owned by the named insured or is leased or entrusted to the named insured under a lease or trust agreement.

II. Definitions.

- (a) **Insured.**--The unqualified word "insured" includes the named insured and also includes any executive officer, director or stockholder thereof while acting within the scope of his duties as such.
- (b) **Contractor.**--The word "contractor" means the Contractor designated in Item 4 of the declarations and includes all subcontractors of said Contractor but shall not include the named insured.
- (c) **Designated employee of the insured.**--The words "designated employee of the insured" mean:
 - (1) any supervisory employee of the insured at the job site,
 - (2) any employee of the insured while operating, attached to or engaged on work trains or other railroad equipment at the job site which are assigned exclusively to the Contractor, or
 - (3) any employee of the insured not within (1) or (2) who is specifically loaned or assigned to the work of the Contractor for prevention of accidents or protection of property, the cost of whose services is borne specifically by the Contractor or by governmental authority.
- (d) **Contract.**--The word "contract" means any contract or agreement to carry a person or property for a consideration or any lease, trust or interchange contract or agreement respecting motive power, rolling stock or mechanical construction equipment.

III. Defense, Settlement, Supplementary Payments.

With respect to such insurance as is afforded by this policy under Coverage's A and B, the company shall:

- (a) defend any suit against the insured alleging such bodily injury or property damage and seeking damages which are payable under the terms of this policy, even if any of the allegations of the suit are groundless, false or fraudulent; but the company may make such investigation and settlement of any claim or suit as it deems expedient;
- (b) pay, in addition to the applicable limits of liability:
 - (1) all expenses incurred by the company, all costs taxed against the insured in any such suit and all interest on the entire amount of any judgment therein which accrues after entry of the judgment and before the company has paid or tendered or deposited in court that part of the judgment which does not exceed the limit of the company's liability thereon;
 - (2) Premiums on appeal bonds required in any such suit, premiums on bonds to release attachments for an amount not in excess of the applicable limit of liability of this policy, but without obligation to apply for or furnish any such bonds;
 - (3) expenses incurred by the insured for such immediate medical and surgical relief to others as shall be imperative at the time of the occurrence;
 - (4) all reasonable expenses, other than loss of earnings, incurred by the insured at the company's request.

IV. Policy Period, Territory.

This policy applies only to occurrences and losses during the policy period and within the United States of America, its territories or possessions, or Canada.

EXCLUSIONS

This policy does not apply:

- (a) to liability assumed by the insured under any contract or agreement except a contract as defined herein;
- (b) to bodily injury or property damage caused intentionally by or at the direction of the insured;
- (c) to bodily injury, property damage or loss which occurs after notification to the named insured of the acceptance of the work by the governmental authority, other than bodily injury, property damage or loss resulting from the existence or removal of tools, uninstalled equipment and abandoned or unused materials;
- (d) under Coverage's A(1), B and C, to bodily injury, property damage or loss, the sole proximate cause of which is an act or omission of any insured other than acts or omissions of any designated employee of any insured;
- (e) under Coverage A, to any obligation for which the insured or any carrier as his insurer may be held liable under any workmen's compensation, unemployment compensation or disability benefits law, or under any similar law; provided that the Federal Employers' Liability Act, U.S. Code (1946), Title 45, Sections 51-60, as amended, shall for the purposes of this insurance be deemed not to be any similar law;
- (f) under Coverage B, to injury to or destruction of property (1) owned by the named insured or (2) leased or entrusted to the named insured under a lease or trust agreement.
- (g) 1. Under any liability coverage, to injury, sickness, disease, death or destruction
 - (a) with respect to which an insured under the policy is also an insured under a nuclear energy liability policy issued by Nuclear Energy Liability Insurance Association, Mutual Atomic Energy Liability Underwriters or Nuclear Insurance Association of Canada, or would be an insured under any such policy but for its termination upon exhaustion of its limit of liability; or
 - (b) resulting from the hazardous properties of nuclear material and with respect to which (1) any person or organization is required to maintain financial protection pursuant to the Atomic Energy Act of 1954, or any law amendatory thereof, or (2) the insured is, or had this policy not been issued would be, entitled to indemnity from the United States of America, or any agency thereof, under any agreement entered into by the United States of America, or any agency thereof, with any person or organization.
- 2. Under any medical payments coverage, or under any Supplementary Payments provision relating to immediate medical or surgical relief, to expenses incurred with respect to bodily injury, sickness, disease or death resulting from the hazardous properties of nuclear material and arising out of the operation of a nuclear facility by any person or organization.
- 3. Under any liability coverage, to injury, sickness, disease, death or destruction resulting from the hazardous properties of nuclear material, if
 - (a) the nuclear material (1) is at any nuclear facility owned by, or operated by or on behalf of, an insured or (2) has been discharged or dispersed therefrom;
 - (b) the nuclear material is contained in spent fuel or waste at any time possessed, handled, used, processed, stored, transported or disposed of by or on behalf of an insured; or
 - (c) the injury, sickness, disease, death or destruction arises out of the furnishing by an insured of services, materials, parts or equipment in connection with the planning, construction, maintenance, operation or use of any nuclear facility, but if such facility is located within the United States of America, its territories or

possessions or Canada, this exclusion (c) applies only to injury to or destruction of property at such nuclear facility.

4. As used in this exclusion:

"hazardous properties" include radioactive, toxic or explosive properties;

"nuclear material" means source material, special nuclear material or byproduct material;

"source material", "special nuclear material", and "byproduct material" have the meanings given them in the Atomic Energy Act of 1954 or in any law amendatory thereof;

"spent fuel" means any fuel element or fuel component, solid or liquid, which has been used or exposed to radiation in a nuclear reactor;

"waste" means any waste material (1) containing byproduct material and (2) resulting from the operation by any person or organization of any nuclear facility included within the definition of nuclear facility under paragraph (a) or (b) thereof;

"nuclear facility" means

- (a) any nuclear reactor,
- (b) any equipment or device designed or used for (1) separating the isotopes of uranium or plutonium, (2) processing or utilizing spent fuel, or (3) handling, processing or packaging waste,
- (c) any equipment or device used for the processing, fabricating or alloying of special nuclear material if at any time the total amount of such material in the custody of the insured at the premises where such equipment or device is located consists of or contains more than 25 grams of plutonium or uranium 233 or any combination thereof, or more than 250 grams of uranium 235,
- (d) any structure, basin, excavation, premises or place prepared or used for the storage or disposal of waste, and includes the site on which any of the foregoing is located, all operations conducted on such site and all premises used for such operations;

"nuclear reactor" means any apparatus designed or used to sustain nuclear fission in a self-supporting chain reaction or to contain a critical mass of fissionable material;

with respect to injury to or destruction of property, the word "injury" or "destruction" includes all forms of radioactive contamination of property.

- (h) under Coverage C, to loss due to nuclear reaction, nuclear radiation or radioactive contamination, or to any act or condition incident to any of the foregoing.

CONDITIONS

(The conditions, except conditions 3, 4, 5, 7, 8, 9, 10, 11 and 12, apply to all coverage's. Conditions 3, 4, 5, 7, 8, 9, 10, 11 and 12, apply only to the coverage noted thereunder.)

- 1. Premium.--**The premium bases and rates for the hazards described in the declarations are stated therein. Premium bases and rates for hazards not so described are those applicable in accordance with the manuals in use by the company. The term "contract cost" means the total cost of all work described in Item 6 of the declarations. The term "rental cost" means the total cost to the Contractor for rental of work trains or other railroad equipment, including the remuneration of all employees of the insured while operating, attached to or engaged thereon. The advance premium stated in the declarations is an estimated premium only. Upon termination of this policy the earned premium shall be computed in accordance with the company's rules, rates, rating plans, premiums and minimum premiums applicable to this insurance. If the earned premium thus computed exceeds the estimated advance premium paid, the company shall look to the Contractor specified in the declarations for any such excess; if less, the company shall return to the said Contractor the unearned portion paid.

In no event shall payment of premium be an obligation of the named insured.
- 2. Inspection.--**The named insured shall make available to the company records of information relating to the subject matter of this insurance. The company shall be permitted to inspect all operations in connection with the work described in Item 6 of the declarations.
- 3. Limits of Liability, Coverage A.--**The limit of bodily injury liability stated in the declarations as applicable to "each person" is the limit of the company's liability for all damages, including damages for care and loss of services, arising out of bodily injury sustained by one person as the result of any one occurrence; the limit of such liability stated in the declarations as applicable to "each occurrence" is, subject to the above provision respecting each person, the total limit of the company's liability for all such damage arising out of bodily injury sustained by two or more persons as the result of any one occurrence.
- 4. Limits of Liability, Coverage's B and C.--**The limit of liability under Coverages B and C stated in the declarations as applicable to "each occurrence" is the total limit of the company's liability for all damages and all loss under Coverage B and C combined arising out of physical injury to, destruction or loss of all property of one or more persons or organizations, including the loss of use of any property due to such injury or destruction under Coverage B, as the result of any one occurrence. Subject to the above provision respecting "each occurrence," the limit of liability under Coverage's B and C stated in the declarations as "aggregate" is the total limit of the company's liability for all damages and all loss under Coverage's B and C combined arising out of physical injury to, destruction or loss of property, including the loss of use of any property due to such injury or destruction under Coverage B.

Under Coverage C, the limit of the company's liability for loss shall not exceed the actual cash value of the property, or if the loss is of a part thereof the actual cash value of such part, at time of loss, nor what it would then cost to repair or replace the property or such part thereof with other of like kind and quality.
- 5. Severalty of Interests, Coverage's A and B.--** The term "the insured" is used severally and not collectively, but the inclusion herein of more than one insured shall not operate to increase the limits of the company's liability.
- 6. Notice.--**In the event of an occurrence or loss, written notice containing particulars sufficient to identify the insured and also reasonably obtainable information with respect to the time, place and circumstances thereof, and the names and addresses of the injured and of available witnesses, shall be given by or for the insured to the company or any of its authorized agents as soon as practicable. If claim is made or suit is brought against the insured, he shall immediately forward to the company every demand, notice, summons or other process received by him or his representative.

- 7. Assistance and Cooperation of the Insured, Coverage's A and B.**--The insured shall cooperate with the company and, upon the company's request, attend hearings and trials and assist in making settlements, securing and giving evidence, obtaining the attendance of witnesses and in the conduct of suits. The insured shall not, except at his own cost, voluntarily make any payment, assume any obligation or incur any expense other than for such immediate medical and surgical relief to others as shall be imperative at the time of accident.
- 8. Action Against Company, Coverages A and B.**--No action shall lie against the company unless, as a condition precedent thereto, the insured shall have fully complied with all the terms of this policy, nor until the amount of the insured's obligation to pay shall have been finally determined either by judgment against the insured after actual trial or by written agreement of the insured, the claimant and the company. Any person or organization or the legal representative thereof who has secured such judgment or written agreement shall thereafter be entitled to recover under this policy to the extent of the insurance afforded by this policy. No person or organization shall have any right under this policy to join the company as a party to any action against the insured to determine the insured's liability. Bankruptcy or insolvency of the insured or of the insured's estate shall not relieve the company of any of its obligations hereunder.
- Coverage C.**--No action shall lie against the company unless, as a condition precedent thereto, there shall have been full compliance with all the terms of this policy nor until 30 days after proof of loss is filed and the amount of loss is determined as provided in this policy.
- 9. Insured's Duties in Event of Loss, Coverage C.**--In the event of loss the insured shall:
- (a) protect the property, whether or not the loss is covered by this policy, and any further loss due to the insured's failure to protect shall not be recoverable under this policy; reasonable expenses incurred in affording such protection shall be deemed incurred at the company's request;
 - (b) file with the company, as soon as practicable after loss, his sworn proof of loss in such form and including such information as the company may reasonably require and shall, upon the company's request, exhibit the damaged property.
- 10. Appraisal, Coverage C.**--If the insured and the company fail to agree as to the amount of loss, either may, within 60 days after the proof of loss is filed, demand an appraisal of the loss. In such event the insured and the company shall each select a competent appraiser, and the appraisers shall select a competent and disinterested umpire. The appraisers shall state separately the actual cash value and the amount of loss and failing to agree shall submit their differences to the umpire. An award in writing of any two shall determine the amount of loss. The insured and the company shall each pay his chosen appraiser and shall bear equally the other expenses of the appraisal and umpire. The company shall not be held to have waived any of its rights by any act relating to appraisal.
- 11. Payment of Loss, Coverage C.**--The company may pay for the loss in money but there shall be no abandonment of the damaged property to the company.
- 12. No Benefit to Bailee, Coverage C.**--The insurance afforded by this policy shall not inure directly or indirectly to the benefit of any carrier or bailee, other than the named insured, liable for loss to the property.
- 13. Subrogation.**--In the event of any payment under this policy, the company shall be subrogated to all the insured's rights of recovery therefor against any person or organization and the insured shall execute and deliver instruments and papers and do whatever else is necessary to secure such rights. The insured shall do nothing after loss to prejudice such rights.
- 14. Application of Insurance.**--The insurance afforded by this policy is primary insurance.
- 15. Three Year Policy.**--A policy period of three years is comprised of three consecutive annual periods. Computation and adjustment of earned premium shall be made at the end of each annual period. Aggregate limits of liability as stated in this policy shall apply separately to each annual period.
- 16. Changes.**--Notice to any agent or knowledge possessed by any agent or by any other person shall not effect a waiver or a change in any part of this policy or stop the company from asserting any right under the terms of this policy; nor shall the terms of this policy be waived or changed, except by endorsement issued to form a part of this policy.

17. Assignment.--Assignment of interest under this policy shall not bind the company until its consent is endorsed hereon.

18. Cancellation.--This policy may be canceled by the named insured by mailing to the company written notice stating when thereafter the cancellation shall be effective. This policy may be canceled by the company by mailing to the named insured, Contractor and governmental authority at the respective addresses shown in this policy written notice stating when not less than 30 days thereafter such cancellation shall be effective. The mailing of notice as aforesaid shall be sufficient proof of notice. The effective date and hour of cancellation stated in the notice shall become the end of the policy period. Delivery of such written notice either by the named insured or by the company shall be equivalent to mailing.

If the named insured cancels, earned premium shall be computed in accordance with the customary short rate table and procedure. If the company cancels, earned premium shall be computed pro rata. Premium adjustment may be made either at the time cancellation is effected or as soon as practicable after cancellation becomes effective, but payment or tender of unearned premium is not a condition of cancellation.

19. Declaration.--By acceptance of this policy the named insured agrees that such statements in the declarations as are made by him are his agreements and representations, that this policy is issued in reliance upon the truth of such representations and that this policy embodies all agreements existing between himself and the company or any of its agents relating to this insurance.

In witness whereof, the _____ Insurance Company has caused this policy to be signed by its president and a secretary at _____, and counter-signed on the declaration page by a duly authorized agent of the company.

(Facsimile of Signature)

(Facsimile of Signature)

Secretary President

CERTIFICATE OF INSURANCE

Exhibit "C"

This is to certify to:

RAILROAD FILE NO.:

- (1) Railroad Agreements Branch, MS #9
Engineering Service Center
California Department of Transportation
State of California
1801 30th Street, Sacramento, California 95816

- (2) and to the following Railroad Company

that such insurance as is afforded by the policy or policies described below for bodily injury liability and property damage liability is in full force and effect as of the date of this certificate and covers the following contractor as a named insured with respect to liability for damages arising out of operations performed by or for the named insured in connection with the contract or work described below.

1. Named Insured and Address

This is to certify that policies of insurance listed below have been issued to the insured named above and are in force at this time. Notwithstanding any requirement, term or condition of any contract or other document with respect to which this certificate may be issued or may pertain, the insurance afforded by the policies described herein is subject to all the terms, exclusions and conditions of such policies.

2. Description of Work

Contract No. _____

3. Coverage's	Policy Expiration Date	Limits of Liability Each Occurrence	Aggregate
Contractor's Bodily Injury Liability and Property Damage Liability			
Umbrella or Excess Liability			

All of the coverages include coverage for the completed operations hazard, and X, C and U exposures.

Name of Insurance Company by Coverage

Coverage's	Company	Policy Number
Bodily Injury Liability		
Property Damage Liability		
Umbrella or Excess Liability		

4. The policy or policies described above will not be amended, altered, modified or cancelled until thirty (30) days after written notice thereof has been given by registered mail to the (1) Railroad Agreements Branch, Engineering Service Center, Department of Transportation, and (2) the Railroad named as certificate holder in this certificate.

Certificate Date:

For _____
(Insurance Company)
State of California

By _____
(Authorized Agent or Representative)

Department of Transportation
DH-0S-A104(8-10-99)

SECTION 14 FEDERAL REQUIREMENTS FOR FEDERAL-AID CONSTRUCTION PROJECTS

GENERAL.—The work herein proposed will be financed in whole or in part with Federal funds, and therefore all of the statutes, rules and regulations promulgated by the Federal Government and applicable to work financed in whole or in part with Federal funds will apply to such work. The "Required Contract Provisions, Federal-Aid Construction Contracts, "Form FHWA 1273, are included in this Section 14. Whenever in said required contract provisions references are made to "SHA contracting officer", "SHA resident engineer", or "authorized representative of the SHA", such references shall be construed to mean "Engineer" as defined in Section 1-1.18 of the Standard Specifications.

PERFORMANCE OF PREVIOUS CONTRACT.—In addition to the provisions in Section II, "Nondiscrimination," and Section VII, "Subletting or Assigning the Contract," of the required contract provisions, the Contractor shall comply with the following:

The bidder shall execute the CERTIFICATION WITH REGARD TO THE PERFORMANCE OF PREVIOUS CONTRACTS OR SUBCONTRACTS SUBJECT TO THE EQUAL OPPORTUNITY CLAUSE AND THE FILING OF REQUIRED REPORTS located in the proposal. No request for subletting or assigning any portion of the contract in excess of \$10,000 will be considered under the provisions of Section VII of the required contract provisions unless such request is accompanied by the CERTIFICATION referred to above, executed by the proposed subcontractor.

NON-COLLUSION PROVISION.—The provisions in this section are applicable to all contracts except contracts for Federal Aid Secondary projects.

Title 23, United States Code, Section 112, requires as a condition precedent to approval by the Federal Highway Administrator of the contract for this work that each bidder file a sworn statement executed by, or on behalf of, the person, firm, association, or corporation to whom such contract is to be awarded, certifying that such person, firm, association, or corporation has not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with the submitted bid. A form to make the non-collusion affidavit statement required by Section 112 as a certification under penalty of perjury rather than as a sworn statement as permitted by 28, USC, Sec. 1746, is included in the proposal.

PARTICIPATION BY MINORITY BUSINESS ENTERPRISES IN SUBCONTRACTING.—Part 23, Title 49, Code of Federal Regulations applies to this Federal-aid project. Pertinent sections of said Code are incorporated in part or in its entirety within other sections of these special provisions.

Schedule B—Information for Determining Joint Venture Eligibility

(This form need not be filled in if all joint venture firms are minority owned.)

1. Name of joint venture _____
2. Address of joint venture _____
3. Phone number of joint venture _____
4. Identify the firms which comprise the joint venture. (The MBE partner must complete Schedule A.) _____

 - a. Describe the role of the MBE firm in the joint venture. _____
 - b. Describe very briefly the experience and business qualifications of each non-MBE joint venturer: _____

5. Nature of the joint venture's business _____
6. Provide a copy of the joint venture agreement.
7. What is the claimed percentage of MBE ownership? _____
8. Ownership of joint venture: (This need not be filled in if described in the joint venture agreement, provided by question 6.).
 - a. Profit and loss sharing.
 - b. Capital contributions, including equipment.
 - c. Other applicable ownership interests.

9. Control of and participation in this contract. Identify by name, race, sex, and "firm" those individuals (and their titles) who are responsible for day-to-day management and policy decision making, including, but not limited to, those with prime responsibility for:

a. Financial decisions _____

b. Management decisions, such as:

(1) Estimating _____

(2). Marketing and sales _____

(3). Hiring and firing of management personnel _____

(4) Purchasing of major items or supplies _____

c. Supervision of field operations _____

Note.—If, after filing this Schedule B and before the completion of the joint venture's work on the contract covered by this regulation, there is any significant change in the information submitted, the joint venture must inform the grantee, either directly or through the prime contractor if the joint venture is a subcontractor.

Affidavit

"The undersigned swear that the foregoing statements are correct and include all material information necessary to identify and explain the terms and operation of our joint venture and the intended participation by each joint venturer in the undertaking. Further, the undersigned covenant and agree to provide to grantee current, complete and accurate information regarding actual joint venture work and the payment therefor and any proposed changes in any of the joint venture arrangements and to permit the audit and examination of the books, records and files of the joint venture, or those of each joint venturer relevant to the joint venture, by authorized representatives of the grantee or the Federal funding agency. Any material misrepresentation will be grounds for terminating any contract which may be awarded and for initiating action under Federal or State laws concerning false statements."

_____ Name of Firm	_____ Name of Firm
_____ Signature	_____ Signature
_____ Name	_____ Name
_____ Title	_____ Title
_____ Date	_____ Date

Date _____

State of _____

County of _____

On this ____ day of _____, 19 __, before me appeared (Name) _____, to me personally known, who, being duly sworn, did execute the foregoing affidavit, and did state that he or she was properly authorized by (Name of firm) _____ to execute the affidavit and did so as his or her free act and deed.

Notary Public _____

Commission expires _____

[Seal]

Date _____

State of _____

County of _____

On this ____ day of _____, 19 __, before me appeared (Name) _____ to me personally known, who, being duly sworn, did execute the foregoing affidavit, and did state that he or she was properly authorized by (Name of firm) _____ to execute the affidavit and did so as his or her free act and deed.

Notary Public _____

Commission expires _____

[Seal]

**REQUIRED CONTRACT PROVISIONS
FEDERAL-AID CONSTRUCTION CONTRACTS**

I. GENERAL

1. These contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract.
2. Except as otherwise provided for in each section, the contractor shall insert in each subcontract all of the stipulations contained in these Required Contract Provisions, and further require their inclusion in any lower tier subcontract or purchase order that may in turn be made. The Required Contract Provisions shall not be incorporated by reference in any case. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with these Required Contract Provisions.
3. A breach of any of the stipulations contained in these Required Contract Provisions shall be sufficient grounds for termination of the contract.
4. A breach of the following clauses of the Required Contract Provisions may also be grounds for debarment as provided in 29 CFR 5.12:

Section I, paragraph 2;
Section IV, paragraphs 1, 2, 3, 4, and 7;
Section V, paragraphs 1 and 2a through 2g.

5. Disputes arising out of the labor standards provisions of Section IV (except paragraph 5) and Section V of these Required Contract Provisions shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the U.S. Department of Labor (DOL) as set forth in 29 CFR 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the DOL, or the contractor's employees or their representatives.
6. **Selection of Labor:** During the performance of this contract, the contractor shall not:
 - a. discriminate against labor from any other State, possession, or territory of the United States (except for employment preference for Appalachian contracts, when applicable, as specified in Attachment A), or
 - b. employ convict labor for any purpose within the limits of the project unless it is labor performed by convicts who are on parole, supervised release, or probation.

II. NONDISCRIMINATION

(Applicable to all Federal-aid construction contracts and to all related subcontracts of \$10,000 or more.)

1. **Equal Employment Opportunity:** Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630, and 41 CFR 60) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140 shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The Equal Opportunity Construction Contract Specifications set forth under 41 CFR 60-4.3 and the provisions of the American Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR 35 and 29 CFR 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:
 - a. The contractor will work with the State highway agency (SHA) and the Federal Government in carrying out EEO obligations and in their review of his/her activities under the contract.
 - b. The contractor will accept as his operating policy the following statement:

"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, national origin, age or disability. Such action shall

include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, preapprenticeship, and/or on-the-job training."

2. **EEO Officer:** The contractor will designate and make known to the SHA contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active contractor program of EEO and who must be assigned adequate authority and responsibility to do so.
3. **Dissemination of Policy:** All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:
 - a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer.
 - b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.
 - c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minority group employees.
 - d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.
 - e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.
4. **Recruitment:** When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minority groups in the area from which the project work force would normally be derived.
 - a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minority group applicants. To meet this requirement, the contractor will identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority group applicants may be referred to the contractor for employment consideration.
 - b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, he is expected to observe the provisions of that agreement to the extent that the system permits the contractor's compliance with EEO contract provisions. (The DOL has held that where implementation of such agreements have the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Executive Order 11246, as amended.)
 - c. The contractor will encourage his present employees to refer minority group applicants for employment. Information and procedures with regard to referring minority group applicants will be discussed with employees.
5. **Personnel Actions:** Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, national origin, age or disability. The following procedures shall be followed:
 - a. The contractor will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.

- b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.
 - c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.
 - d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with his obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of his avenues of appeal.
6. Training and Promotion:
- a. The contractor will assist in locating, qualifying, and increasing the skills of minority group and women employees, and applicants for employment.
 - b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training. In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision.
 - c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.
 - d. The contractor will periodically review the training and promotion potential of minority group and women employees and will encourage eligible employees to apply for such training and promotion.
7. **Unions:** If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use his/her best efforts to obtain the cooperation of such unions to increase opportunities for minority groups and women within the unions, and to effect referrals by such unions of minority and female employees. Actions by the contractor either directly or through a contractor's association acting as agent will include the procedures set forth below:
- a. The contractor will use best efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minority group members and women for membership in the unions and increasing the skills of minority group employees and women so that they may qualify for higher paying employment.
 - b. The contractor will use best efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, national origin, age or disability.
 - c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the SHA and shall set forth what efforts have been made to obtain such information.
 - d. In the event the union is unable to provide the contractor with a reasonable flow of minority and women referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, national origin, age or disability; making full efforts to obtain qualified and/or qualifiable minority group persons and women. (The DOL has held that it shall be no excuse that the union with which the contractor has a collective bargaining agreement providing for exclusive referral failed to refer minority employees.) In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the SHA.

8. **Selection of Subcontractors, Procurement of Materials and Leasing of Equipment:** The contractor shall not discriminate on the grounds of race, color, religion, sex, national origin, age or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment.
- a. The contractor shall notify all potential subcontractors and suppliers of his/her EEO obligations under this contract.
 - b. Disadvantaged business enterprises (DBE), as defined in 49 CFR 23, shall have equal opportunity to compete for and perform subcontracts which the contractor enters into pursuant to this contract. The contractor will use his best efforts to solicit bids from and to utilize DBE subcontractors or subcontractors with meaningful minority group and female representation among their employees. Contractors shall obtain lists of DBE construction firms from SHA personnel.
 - c. The contractor will use his best efforts to ensure subcontractor compliance with their EEO obligations.
9. **Records and Reports:** The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following completion of the contract work and shall be available at reasonable times and places for inspection by authorized representatives of the SHA and the FHWA.
- a. The records kept by the contractor shall document the following:
 - (1) The number of minority and non-minority group members and women employed in each work classification on the project;
 - (2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women;
 - (3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minority and female employees; and
 - (4) The progress and efforts being made in securing the services of DBE subcontractors or subcontractors with meaningful minority and female representation among their employees.
 - b. The contractors will submit an annual report to the SHA each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on Form FHWA-1391. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data.

III. NONSEGREGATED FACILITIES

(Applicable to all Federal-aid construction contracts and to all related subcontracts of \$10,000 or more.)

- a. By submission of this bid, the execution of this contract or subcontract, or the consummation of this material supply agreement or purchase order, as appropriate, the bidder, Federal-aid construction contractor, subcontractor, material supplier, or vendor, as appropriate, certifies that the firm does not maintain or provide for its employees any segregated facilities at any of its establishments, and that the firm does not permit its employees to perform their services at any location, under its control, where segregated facilities are maintained. The firm agrees that a breach of this certification is a violation of the EEO provisions of this contract. The firm further certifies that no employee will be denied access to adequate facilities on the basis of sex or disability.
- b. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms and washrooms, restaurants and other eating areas, time clocks, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive, or are, in fact, segregated on the basis of race, color, religion, national origin, age or disability, because of habit, local custom, or otherwise. The only exception will be for the disabled when the demands for accessibility override (e.g. disabled parking).

- c. The contractor agrees that it has obtained or will obtain identical certification from proposed subcontractors or material suppliers prior to award of subcontracts or consummation of material supply agreements of \$10,000 or more and that it will retain such certifications in its files.

IV. PAYMENT OF PREDETERMINED MINIMUM WAGE

(Applicable to all Federal-aid construction contracts exceeding \$2,000 and to all related subcontracts, except for projects located on roadways classified as local roads or rural minor collectors, which are exempt.)

1. General:

- a. All mechanics and laborers employed or working upon the site of the work will be paid unconditionally and not less often than once a week and without subsequent deduction or rebate on any account [except such payroll deductions as are permitted by regulations (29 CFR 3)] issued by the Secretary of Labor under the Copeland Act (40 U.S.C. 276c) the full amounts of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment. The payment shall be computed at wage rates not less than those contained in the wage determination of the Secretary of Labor (hereinafter "the wage determination") which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor or its subcontractors and such laborers and mechanics. The wage determination (including any additional classifications and wage rates conformed under paragraph 2 of this Section IV and the DOL poster (WH-1321) or Form FHWA-1495) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers. For the purpose of this Section, contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b)(2) of the Davis-Bacon Act (40 U.S.C. 276a) on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of Section IV, paragraph 3b, hereof. Also, for the purpose of this Section, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in paragraphs 4 and 5 of this Section IV.
- b. Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein, provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed.
- c. All rulings and interpretations of the Davis-Bacon Act and related acts contained in 29 CFR 1, 3, and 5 are herein incorporated by reference in this contract.

2. Classification:

- a. The SHA contracting officer shall require that any class of laborers or mechanics employed under the contract, which is not listed in the wage determination, shall be classified in conformance with the wage determination.
- b. The contracting officer shall approve an additional classification, wage rate and fringe benefits only when the following criteria have been met:
 - (1) the work to be performed by the additional classification requested is not performed by a classification in the wage determination;
 - (2) the additional classification is utilized in the area by the construction industry;
 - (3) the proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination; and
 - (4) with respect to helpers, when such a classification prevails in the area in which the work is performed.
- c. If the contractor or subcontractors, as appropriate, the laborers and mechanics (if known) to be employed in the additional classification or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the DOL, Administrator of the Wage and Hour Division, Employment Standards Administration, Washington, D.C. 20210. The Wage and Hour Administrator, or an authorized

representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

- d. In the event the contractor or subcontractors, as appropriate, the laborers or mechanics to be employed in the additional classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. Said Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary
- e. The wage rate (including fringe benefits where appropriate) determined pursuant to paragraph 2c or 2d of this Section IV shall be paid to all workers performing work in the additional classification from the first day on which work is performed in the classification.

3. Payment of Fringe Benefits:

- a. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor or subcontractors, as appropriate, shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly case equivalent thereof.
- b. If the contractor or subcontractor, as appropriate, does not make payments to a trustee or other third person, he/she may consider as a part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, provided, that the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

4. Apprentices and Trainees (Programs of the U.S. DOL) and Helpers:

- a. Apprentices:
 - (1) Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the DOL, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State apprenticeship agency recognized by the Bureau, or if a person is employed in his/her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State apprenticeship agency (where appropriate) to be eligible for probationary employment as an apprentice.
 - (2) The allowable ratio of apprentices to journeyman-level employees on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any employee listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate listed in the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor or subcontractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman-level hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.
 - (3) Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeyman-level hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator for the Wage and Hour Division determines that a different

practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

- (4) In the event the Bureau of Apprenticeship and Training, or a State apprenticeship agency recognized by the Bureau, withdraws approval of an apprenticeship program, the contractor or subcontractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the comparable work performed by regular employees until an acceptable program is approved.

b. Trainees:

- (1) Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the DOL, Employment and Training Administration.
- (2) The ratio of trainees to journeyman-level employees on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.
- (3) Every trainee must be paid at not less than the rate specified in the approved program for his/her level of progress, expressed as a percentage of the journeyman-level hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman-level wage rate on the wage determination which provides for less than full fringe benefits for apprentices, in which case such trainees shall receive the same fringe benefits as apprentices.
- (4) In the event the Employment and Training Administration withdraws approval of a training program, the contractor or subcontractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

c. Helpers:

Helpers will be permitted to work on a project if the helper classification is specified and defined on the applicable wage determination or is approved pursuant to the conformance procedure set forth in Section IV.2. Any worker listed on a payroll at a helper wage rate, who is not a helper under an approved definition, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed.

5. Apprentices and Trainees (Programs of the U.S. DOT):

Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.

6. Withholding:

The SHA shall upon its own action or upon written request of an authorized representative of the DOL withhold, or cause to be withheld, from the contractor or subcontractor under this contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements which is held by the same prime contractor, as much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or

part of the wages required by the contract, the SHA contracting officer may, after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

7. Overtime Requirements:

No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers, mechanics, watchmen, or guards (including apprentices, trainees, and helpers described in paragraphs 4 and 5 above) shall require or permit any laborer, mechanic, watchman, or guard in any workweek in which he/she is employed on such work, to work in excess of 40 hours in such workweek unless such laborer, mechanic, watchman, or guard receives compensation at a rate not less than one-and-one-half times his/her basic rate of pay for all hours worked in excess of 40 hours in such workweek.

8. Violation:

Liability for Unpaid Wages; Liquidated Damages: In the event of any violation of the clause set forth in paragraph 7 above, the contractor and any subcontractor responsible thereof shall be liable to the affected employee for his/her unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory) for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer, mechanic, watchman, or guard employed in violation of the clause set forth in paragraph 7, in the sum of \$10 for each calendar day on which such employee was required or permitted to work in excess of the standard work week of 40 hours without payment of the overtime wages required by the clause set forth in paragraph 7.

9. Withholding for Unpaid Wages and Liquidated Damages:

The SHA shall upon its own action or upon written request of any authorized representative of the DOL withhold, or cause to be withheld, from any monies payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph 8 above.

V. STATEMENTS AND PAYROLLS

(Applicable to all Federal-aid construction contracts exceeding \$2,000 and to all related subcontracts, except for projects located on roadways classified as local roads or rural collectors, which are exempt.)

1. Compliance with Copeland Regulations (29 CFR 3):

The contractor shall comply with the Copeland Regulations of the Secretary of Labor which are herein incorporated by reference.

2. Payrolls and Payroll Records:

- a. Payrolls and basic records relating thereto shall be maintained by the contractor and each subcontractor during the course of the work and preserved for a period of 3 years from the date of completion of the contract for all laborers, mechanics, apprentices, trainees, watchmen, helpers, and guards working at the site of the work.
- b. The payroll records shall contain the name, social security number, and address of each such employee; his or her correct classification; hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalent thereof of the types described in Section 1(b)(2)(B) of the Davis Bacon Act); daily and weekly number of hours worked; deductions made; and actual wages paid. In addition, for Appalachian contracts, the payroll records shall contain a notation indicating whether the employee does, or does not, normally reside in the labor area as defined in Attachment A, paragraph 1. Whenever the Secretary of Labor, pursuant to Section IV, paragraph 3b, has found that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section 1(b)(2)(B) of the Davis Bacon Act, the contractor and each subcontractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, that the plan or program has been communicated in writing to the laborers or mechanics affected, and show the cost anticipated or the actual cost incurred in providing benefits. Contractors or subcontractors employing

apprentices or trainees under approved programs shall maintain written evidence of the registration of apprentices and trainees, and ratios and wage rates prescribed in the applicable programs.

- c. Each contractor and subcontractor shall furnish, each week in which any contract work is performed, to the SHA resident engineer a payroll of wages paid each of its employees (including apprentices, trainees, and helpers, described in Section IV, paragraphs 4 and 5, and watchmen and guards engaged on work during the preceding weekly payroll period). The payroll submitted shall set out accurately and completely all of the information required to be maintained under paragraph 2b of this Section V. This information may be submitted in any form desired. Optional Form WH-347 is available for this purpose and may be purchased from the Superintendent of Documents (Federal stock number 029-005-0014-1), U.S. Government Printing Office, Washington, D.C. 20402. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors.
- d. Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his/her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:
 - (1) that the payroll for the payroll period contains the information required to be maintained under paragraph 2b of this Section V and that such information is correct and complete;
 - (2) that such laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in the Regulations, 29 CFR 3;
 - (3) that each laborer or mechanic has been paid not less than the applicable wage rate and fringe benefits or cash equivalent for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.
- e. The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 2d of this Section V.
- f. The falsification of any of the above certifications may subject the contractor to civil or criminal prosecution under 18 U.S.C. 1001 and 31 U.S.C. 231.
- g. The contractor or subcontractor shall make the records required under paragraph 2b of this Section V available for inspection, copying, or transcription by authorized representatives of the SHA, the FHWA, or the DOL, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the SHA, the FHWA, the DOL, or all may, after written notice to the contractor, sponsor, applicant, or owner, take such actions as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

VI. RECORD OF MATERIALS, SUPPLIES, AND LABOR

1. On all Federal-aid contracts on the National Highway System, except those which provide solely for the installation of protective devices at railroad grade crossings, those which are constructed on a force account or direct labor basis, highway beautification contracts, and contracts for which the total final construction cost for roadway and bridge is less than \$1,000,000 (23 CFR 635) the contractor shall:
 - a. Become familiar with the list of specific materials and supplies contained in Form FHWA-47, "Statement of Materials and Labor Used by Contractor of Highway Construction Involving Federal Funds," prior to the commencement of work under this contract.
 - b. Maintain a record of the total cost of all materials and supplies purchased for and incorporated in the work, and also of the quantities of those specific materials and supplies listed on Form FHWA-47, and in the units shown on Form FHWA-47.

- c. Furnish, upon the completion of the contract, to the SHA resident engineer on Form FHWA-47 together with the data required in paragraph 1b relative to materials and supplies, a final labor summary of all contract work indicating the total hours worked and the total amount earned.
2. At the prime contractor's option, either a single report covering all contract work or separate reports for the contractor and for each subcontract shall be submitted.

VII. SUBLETTING OR ASSIGNING THE CONTRACT

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the State. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635).
 - a. "Its own organization" shall be construed to include only workers employed and paid directly by the prime contractor and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor, assignee, or agent of the prime contractor.
 - b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid on the contract as a whole and in general are to be limited to minor components of the overall contract.
2. The contract amount upon which the requirements set forth in paragraph 1 of Section VII is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.
3. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the SHA contracting officer determines is necessary to assure the performance of the contract.
4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the SHA contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the SHA has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.

VIII. SAFETY: ACCIDENT PREVENTION

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the SHA contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.
2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 333).
3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 333).

IX. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, the following notice shall be posted on each Federal-aid highway project (23 CFR 635) in one or more places where it is readily available to all persons concerned with the project:

Notice To All Personnel Engaged On Federal-Aid Highway Projects

18 U.S.C. 1020 READS AS FOLLOWS:

"Whoever being an officer, agent, or employee of the United States, or any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined not more than \$10,000 or imprisoned not more than 5 years or both."

X. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT

(Applicable to all Federal-aid construction contracts and to all related subcontracts of \$100,000 or more.)

By submission of this bid or the execution of this contract, or subcontract, as appropriate, the bidder, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any facility that is or will be utilized in the performance of this contract, unless such contract is exempt under the Clean Air Act, as amended (42 U.S.C. 1857 et seq., as amended by Pub.L. 91-604), and under the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 et seq., as amended by Pub.L. 92-500), Executive Order 11738, and regulations in implementation thereof (40 CFR 15) is not listed, on the date of contract award, on the U.S. Environmental Protection Agency (EPA) List of Violating Facilities pursuant to 40 CFR 15.20.
2. That the firm agrees to comply and remain in compliance with all the requirements of Section 114 of the Clean Air Act and Section 308 of the Federal Water Pollution Control Act and all regulations and guidelines listed thereunder.
3. That the firm shall promptly notify the SHA of the receipt of any communication from the Director, Office of Federal Activities, EPA, indicating that a facility that is or will be utilized for the contract is under consideration to be listed on the EPA List of Violating Facilities.
4. That the firm agrees to include or cause to be included the requirements of paragraph 1 through 4 of this Section X in every nonexempt subcontract, and further agrees to take such action as the government may direct as a means of enforcing such requirements.

XI. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

1. Instructions for Certification - Primary Covered Transactions:

(Applicable to all Federal-aid contracts - 49 CFR 29)

- a. By signing and submitting this proposal, the prospective primary participant is providing the certification set out below.
- b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective primary participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.
- c. The certification in this clause is a material representation of fact upon which reliance was placed when the department or agency determined to enter into this transaction. If it is later determined that the prospective primary participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause of default.
- d. The prospective primary participant shall provide immediate written notice to the department or agency to whom this proposal is submitted if any time the prospective primary participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
- e. The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the department or agency to which this proposal is submitted for assistance in obtaining a copy of those regulations.
- f. The prospective primary participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.
- g. The prospective primary participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," provided by the department or agency entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.
- h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the nonprocurement portion of the "Lists of Parties Excluded From Federal Procurement or Nonprocurement Programs" (Nonprocurement List) which is compiled by the General Services Administration.
- i. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
- j. Except for transactions authorized under paragraph f of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion — Primary Covered Transactions

1. The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:

- a. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;
 - b. Have not within a 3-year period preceding this proposal been convicted of or had a civil judgement rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
 - c. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph 1b of this certification; and
 - d. Have not within a 3-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.
2. Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

2. Instructions for Certification - Lower Tier Covered Transactions:

(Applicable to all subcontracts, purchase orders and other lower tier transactions of \$25,000 or more - 49 CFR 29)

- a. By signing and submitting this proposal, the prospective lower tier is providing the certification set out below.
- b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.
- c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances.
- d. The terms "covered transaction," "debarred," "suspended," "ineligible," "primary covered transaction," "participant," "person," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations.
- e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.
- f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.
- g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Nonprocurement List.
- h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is

not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

- i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion — Lower Tier Covered Transactions

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.
2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

XII. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING

(Applicable to all Federal-aid construction contracts and to all related subcontracts which exceed \$100,000 - 49 CFR 20)

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:
 - a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
 - b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.
2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.
3. The prospective participant also agrees by submitting his or her bid or proposal that he or she shall require that the language of this certification be included in all lower tier subcontracts, which exceed \$100,000 and that all such recipients shall certify and disclose accordingly.

FEDERAL-AID FEMALE AND MINORITY GOALS

In accordance with Section II, "Nondiscrimination," of "Required Contract Provisions Federal-aid Construction Contracts" the following are the goals for female utilization:

Goal for Women (applies nationwide).....(percent)	6.9
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The following are goals for minority utilization:

CALIFORNIA ECONOMIC AREA

		Goal (Percent)
174	Redding, CA:	
	Non-SMSA Counties	6.8
	CA Lassen; CA Modoc; CA Plumas; CA Shasta; CA Siskiyou; CA Tehama.	
175	Eureka, CA	
	Non-SMSA Counties	6.6
	CA Del Norte; CA Humboldt; CA Trinity.	
176	San Francisco-Oakland-San Jose, CA:	
	SMSA Counties:	
	7120 Salinas-Seaside-Monterey, CA	28.9
	CA Monterey.	
	7360 San Francisco-Oakland	25.6
	CA Alameda; CA Contra Costa; CA Marin; CA San Francisco; CA San Mateo.	
	7400 San Jose, CA	19.6
	CA Santa Clara.	
	7485 Santa Cruz, CA.	14.9
	CA Santa Cruz.	
	7500 Santa Rosa, CA	9.1
	CA Sonoma.	
	8720 Vallejo-Fairfield- Napa, CA	17.1
	CA Napa; CA Solano	
	Non-SMSA Counties	23.2
	CA Lake; CA Mendocino; CA San Benito	
177	Sacramento, CA:	
	SMSA Counties:	
	6920 Sacramento, CA	16.1
	CA Placer; CA Sacramento; CA Yolo.	
	Non-SMSA Counties	14.3
	CA Butte; CA Colusa; CA El Dorado; CA Glenn; CA Nevada; CA Sierra; CA Sutter; CA Yuba.	
178	Stockton-Modesto, CA:	
	SMSA Counties:	
	5170 Modesto, CA	12.3
	CA Stanislaus.	
	8120 Stockton, CA	24.3
	CA San Joaquin.	
	Non-SMSA Counties	19.8
	CA Alpine; CA Amador; CA Calaveras; CA Mariposa; CA Merced; CA Tuolumne.	

		Goal (Percent)
179	Fresno-Bakersfield, CA	
	SMSA Counties:	
	0680 Bakersfield, CA CA Kern.	19.1
	2840 Fresno, CA CA Fresno.	26.1
	Non-SMSA Counties CA Kings; CA Madera; CA Tulare.	23.6
180	Los Angeles, CA:	
	SMSA Counties:	
	0360 Anaheim-Santa Ana-Garden Grove, CA CA Orange.	11.9
	4480 Los Angeles-Long Beach, CA CA Los Angeles.	28.3
	6000 Oxnard-Simi Valley-Ventura, CA CA Ventura.	21.5
	6780 Riverside-San Bernardino-Ontario, CA. CA Riverside; CA San Bernardino.	19.0
	7480 Santa Barbara-Santa Maria-Lompoc, CA CA Santa Barbara.	19.7
	Non-SMSA Counties CA Inyo; CA Mono; CA San Luis Obispo.	24.6
181	San Diego, CA:	
	SMSA Counties	
	7320 San Diego, CA. CA San Diego.	16.9
	Non-SMSA Counties CA Imperial.	18.2

In addition to the reporting requirements set forth elsewhere in this contract the Contractor and subcontractors holding subcontracts, not including material suppliers, of \$10,000 or more, shall submit for every month of July during which work is performed, employment data as contained under Form FHWA PR-1391 (Appendix C to 23 CFR, Part 230), and in accordance with the instructions included thereon.

FEDERAL REQUIREMENT TRAINING SPECIAL PROVISIONS

As part of the Contractor's equal employment opportunity affirmative action program, training shall be provided as follows:

The Contractor shall provide on-the-job training to develop full journeymen in the types of trades or job classification involved.

The goal for the number of trainees or apprentices to be trained under the requirements of this special provision will be 48.

In the event the Contractor subcontracts a portion of the contract work, he shall determine how many, if any, of the trainees or apprentices are to be trained by the subcontractor, provided however, that the Contractor shall retain the primary responsibility for meeting the training requirements imposed by this special provision. The Contractor shall also insure that this Training Special Provision is made applicable to such subcontract. Where feasible, 25 percent of trainees or apprentices in each occupation shall be in their first year of apprenticeship or training.

The number of trainees or apprentices shall be distributed among the work classifications on the basis of the Contractor's needs and the availability of journeymen in the various classifications within a reasonable area of recruitment. Prior to commencing work, the Contractor shall submit to the Department for approval the number of trainees or apprentices to be trained in each selected classification and training program to be used. Furthermore, the Contractor shall specify the starting time for training in each of the classifications. The Contractor will be credited for each trainee or apprentice employed by him on the contract work who is currently enrolled or becomes enrolled in an approved program and will be reimbursed for such trainees or apprentices as provided hereinafter.

Training and upgrading of minorities and women toward journeymen status is a primary objective of this Training Special Provision. Accordingly, the Contractor shall make every effort to enroll minority and women trainees or apprentices (e.g., by conducting systematic and direct recruitment through public and private sources likely to yield minority and women trainees or apprentices) to the extent such persons are available within a reasonable area of recruitment. The Contractor will be responsible for demonstrating the steps that he has taken in pursuance thereof, prior to a determination as to whether the Contractor is in compliance with this Training Special Provision. This training commitment is not intended, and shall not be used, to discriminate against any applicant for training, whether a member of a minority group or not.

No employee shall be employed as a trainee or apprentice in any classification in which he has successfully completed a training course leading to journeyman status or in which he has been employed as a journeyman. The Contractor should satisfy this requirement by including appropriate questions in the employee application or by other suitable means. Regardless of the method used the Contractor's records should document the findings in each case.

The minimum length and type of training for each classification will be as established in the training program selected by the Contractor and approved by both the Department and the Federal Highway Administration. The Department and the Federal Highway Administration will approve a program if it is reasonably calculated to meet the equal employment opportunity obligations of the Contractor and to qualify the average trainee or apprentice for journeyman status in the classification concerned by the end of the training period. Furthermore, apprenticeship programs registered with the U.S. Department of Labor, Bureau of Apprenticeship and Training, or with the State of California, Department of Industrial Relations, Division of Apprenticeship Standards recognized by the Bureau and training programs approved but not necessarily sponsored by the U.S. Department of Labor, Manpower Administration, Bureau of Apprenticeship and Training shall also be considered acceptable provided it is being administered in a manner consistent with the equal employment obligations of Federal-aid highway construction contracts. Approval or acceptance of a training program shall be obtained from the State prior to commencing work on the classification covered by the program. It is the intention of these provisions that training is to be provided in the construction crafts rather than clerk-typists or secretarial-type positions. Training is permissible in lower level management positions such as office engineers, estimators, timekeepers, etc., where the training is oriented toward construction applications. Training in the laborer classification may be permitted provided that significant and meaningful training is provided and approved by the division office. Some offsite training is permissible as long as the training is an integral part of an approved training program and does not comprise a significant part of the overall training.

Except as otherwise noted below, the Contractor will be reimbursed 80 cents per hour of training given an employee on this contract in accordance with an approved training program. As approved by the Engineer, reimbursement will be made for training of persons in excess of the number specified herein. This reimbursement will be made even though the Contractor receives additional training program funds from other sources, provided such other source does not specifically prohibit the Contractor from receiving other reimbursement. Reimbursement for offsite training indicated above may only be made to the Contractor where he does one or more of the following and the trainees or apprentices are concurrently employed on a Federal-aid project; contributes to the cost of the training, provides the instruction to the trainee or apprentice or pays the trainee's or apprentice's wages during the offsite training period.

No payment shall be made to the Contractor if either the failure to provide the required training, or the failure to hire the trainee or apprentice as a journeyman, is caused by the Contractor and evidences a lack of good faith on the part of the Contractor in meeting the requirements of this Training Special Provision. It is normally expected that a trainee or apprentice will begin his training on the project as soon as feasible after start of work utilizing the skill involved and remain on the project as long as training opportunities exist in his work classification or until he has completed his training program. It is not required that all trainees or apprentices be on board for the entire length of the contract. A Contractor will have fulfilled his responsibilities under this Training Special Provision if he has provided acceptable training to the number of trainees or apprentices specified. The number trained shall be determined on the basis of the total number enrolled on the contract for a significant period.

Only trainees or apprentices registered in a program approved by the State of California's State Administrator of Apprenticeship may be employed on the project and said trainees or apprentices shall be paid the standard wage specified under the regulations of the craft or trade at which they are employed.

The Contractor shall furnish the trainee or apprentice a copy of the program he will follow in providing the training. The Contractor shall provide each trainee or apprentice with a certification showing the type and length of training satisfactorily completed.

The Contractor will provide for the maintenance of records and furnish periodic reports documenting his performance under this Training Special Provision.